10. CUMULATIVE IMPACTS

10 (3)
Comment - 16 comments summarized
Commenters said that the EIS did not adequately account for the cumulative impacts from past, present, and future transport of all radioactive and hazardous materials to the repository, to the Nevada Test Site, and to the Waste Isolation Pilot Plant in New Mexico. Some said that the cumulative impacts from all these waste shipments should have been integrated into one risk model, especially considering that the Nevada Test Site is a preferred alternative for the disposal of the Nation's low-level and mixed low-level radioactive waste and other hazardous materials. Commenters stated the routes that would be used to transport waste to Yucca Mountain are the same routes being used to carry transuranic wastes to the Waste Isolation Pilot Plant in New Mexico. Others said that all this waste transport is a violation of the principle of informed consent for citizens traveling the Nation's highways. Some said that DOE has also failed to inform emergency responders and state transportation departments of potential problems by not integrating accident and risk data from the Waste Isolation Pilot Plant and Yucca Mountain. Some said that the cumulative impacts from waste transport would be particularly adverse to residents of Nye and Clark Counties, Nevada.

Response
Section 8.4 of the EIS describes the cumulative impacts of past, present, and reasonably foreseeable shipments of radioactive materials throughout the nation and in Nevada. Table 8-58 lists the collective worker-dose and general-population dose (in person-rem), and traffic fatalities, from these actions between 1943 and 2047 (including mixed low-level radioactive waste). The table includes shipments of low-level waste to the Nevada Test Site (this includes the designation of the Nevada Test Site as a regional DOE low-level waste disposal site); shipments of transuranic waste to the Waste Isolation Pilot Plant in New Mexico; and shipments of spent nuclear fuel and high-level radioactive waste to various storage and disposal sites throughout the nation.

The Department is not aware of the specific "informed consent" principle to which the commenters refer. Transportation of hazardous materials requires informing the appropriate government agencies and adhering to requirements of the Federal Government and affected state governments, which act to protect the public. Further, transport vehicles must have special placards to identify hazards that might be on board the transport vehicle; these placards are visible to other drivers on the highways. In addition, public documents, such as this EIS, inform the public of potential risks that might accompany transportation activities.

Section 180(c) of the Nuclear Waste Policy Act, as amended (this EIS refers to the amended Act as the NWPA), requires DOE to provide technical assistance and funds to states for training of public safety officials of appropriate units of local government and Native American tribes through whose jurisdictions the Department would transport spent nuclear fuel and high-level radioactive waste. The training shall cover procedures required for safe routine transportation of these materials, as well as procedures for dealing with emergency response situations. If there was a decision to proceed with the development of a repository at Yucca Mountain, shipping routes would be identified approximately 5 years before shipments begin and Section 180(c) assistance would be made available approximately 4 years prior to shipments through a jurisdiction. See Section M.6 of the EIS for a discussion of the DOE Section 180(c) Policy and Procedures.

The Price-Anderson Act establishes a system of financial protection (compensation for personal injury and property damage, including loss of use of property) for the public in a nuclear accident, regardless of who causes the damage. See Section M.8 of the EIS for a discussion of the Price-Anderson Act.

10 (91)
Comment - 12 comments summarized
Commenters said that the EIS did not examine (or did not examine adequately) the cumulative impacts to groundwater from the repository and from past, present, and future activities at the Nevada Test Site. Some noted that DOE had detonated nuclear explosions below the water table and that plutonium had migrated more than a mile from these detonations via colloids. According to some, plutonium migration might be more extensive, but DOE has gathered little information about groundwater conditions on the Nevada Test Site and groundwater flow between

the Test Site and Yucca Mountain. Some wanted to know why DOE has not examined the groundwater system on the Test Site with the same vigor that it has examined groundwater conditions at Yucca Mountain.

Response
Chapter 8 of the EIS discusses the cumulative impacts from the repository, along with the impacts of past, present, and reasonably foreseeable activities in the region. Section 8.3.2.1 describes the impacts to groundwater from past underground testing at the Nevada Test Site. Section 8.3.2.1 also discusses the movement of plutonium from underground test sites by binding with colloids, which is believed to account for this movement. Since issuing the Draft EIS, the Department has revised the analyses of impacts associated with the Nevada Test Site. Section 8.3 of the Final EIS includes updated estimates of future impacts to groundwater from activities on the Test Site. These estimates indicate that the potential dose to a receptor from groundwater from the Nevada Test Site is much less than 1 millirem per year, and the Department does not believe that adverse impacts would result from this small dose alone or combined with long-term releases from a repository at Yucca Mountain.

When DOE prepared the Draft EIS, it used the best available information to estimate cumulative impacts. While some data were available for the groundwater system at the Nevada Test Site, these data were not as complete as those available for the groundwater system between the repository and populated areas to the south. This is why the EIS analysis could not apply the same rigor to areas on the Nevada Test Site north of the repository compared to areas south of the repository. To compensate for this imbalance in available information, the EIS used a very conservative approach to bound estimated impacts. In other words, the Department believes that potential impacts associated with the Nevada Test Site were overestimated. This type of conservative analysis is designed to account for uncertainties by assuming very conservative values for parameters and not taking credit for possible mitigating effects. For example, the regional groundwater flow model developed by the U.S. Geological Survey for the repository program (DIRS 100131-D'Agnese et al. 1997) indicates that some groundwater from the Nevada Test Site flows southward toward the Amargosa Desert in the vicinity of Yucca Mountain. However, the actual transport times and groundwater pathways from potential radionuclide contaminants on the Test Site are not clearly known. Although very unlikely to occur, the Department assumed, for purposes of analysis in the Draft and Final EIS, that contaminants from the Nevada Test Site would move through identical pathways and have identical transport times as the material from the repository because this would provide an upper, bounding estimate of the possible impact to groundwater from the repository and the Nevada Test Site.

The qualitative calculation of the cumulative groundwater impacts from the Nevada Test Site and from a repository at Yucca Mountain indicates that the potential cumulative peak dose would be well below the regulatory limits in 40 CFR Part 197 (see Section 8.3.2.1.1). Moreover, this cumulative peak-dose would occur only in the unlikely event that the peak radiological concentrations from the Nevada Test Site and from Yucca Mountain occurred at the same time in the future and in the same location, which is unlikely.

10 (104)
Comment - 20 comments summarized
Commenters said that the EIS did not examine the cumulative impacts from all Federal and non-Federal actions and policies in the affected area. Agencies and organizations cited included the DOE, the Department of Defense, the Forest Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management, the National Park Service, the Timbisha-Shoshone Tribe (with regard to the acquisition of trust lands), and the Clark County/Las Vegas Valley Water District. Others focused specifically on Nye County, stating that the EIS did not consider the cumulative impacts from the repository withdrawal, along with the millions of acres of Federal land already withdrawn for national parks, forests, wildlife refuges, and defense purposes in and near Nye County. Some said that the many separate resource-planning documents prepared by these and other agencies have not been coordinated among the agencies and have had, and will continue to have, cumulative impacts on the residents of Nye County through a variety of lost opportunities. Others said that residents of Nye County have been disproportionately affected by these Federal actions, citing lost opportunities due to the many land-use restrictions that have been imposed in Nye County, including what some commenters contend is a stated policy of the National Park Service and the Bureau of Land Management to protest local water-right applications in southern Nye County.

Response
Chapter 8 of the EIS discusses the potential impacts of the proposed repository, along with the impacts from past, present, and reasonably foreseeable future actions in the affected area. In preparing this chapter, the Department

reviewed many documents to determine where there was potential for cumulative impacts. These documents included resource plans by land management agencies, EISs, environmental assessments, strategic plans, records of tribal meetings, and other documents prepared by Federal, state, local, and private organizations. The analyses and results described in Chapter 8 considered only those impacts from activities that have the potential to coincide in time and space with impacts from the repository. Based on some of the comments received by the Department on the Draft EIS and the Supplement to the Draft EIS and more recent information on activities at the Nevada Test Site, DOE modified several analyses in the Final EIS. DOE believes that the Final EIS analyzes the appropriate range of past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts.

The Department understands that large tracts of land have been withdrawn from public use in southern Nevada and adjoining parts of California for reasons of national defense and environmental protection. Section 8.2.1 of the Final EIS includes a more detailed discussion of potential cumulative impacts from these land withdrawals. While it is true that land in Nevada has been withdrawn for national defense and environmental protection, other lands have passed out of the public domain. For instance, the Southern Nevada Public Land Management Act allows the Bureau of Land Management to sell public lands to promote responsible and orderly development.

The opposition to a water-appropriation application by an agency is not an environmental impact associated with the availability of water resources. This is because the filing of a protest does not determine the outcome of the water-application process. The Nevada State Engineer is independent of the Federal Government.

10 (242)
Comment - 3 comments summarized
Commenters said that nuclear weapons are still being tested at the Nevada Test Site and that this needs to be included in the cumulative impacts assessment. Others cited a high likelihood for a resumption of nuclear weapons testing at the Nevada Test Site, citing the recent failure of the Comprehensive Test Ban Treaty in Congress. Some stated that the Draft EIS did not contemplate a resumption of weapons testing, but that the 1986 environmental assessment of Yucca Mountain did, stating that workers would not be allowed in the underground repository during planned weapons tests for safety reasons.

Response
Since 1992, there has been a moratorium on nuclear testing. Even though the Nevada Test Site must maintain the ability to resume testing, the Department does not believe that a resumption of testing is a reasonably foreseeable action. Therefore, it was not included in the analyses in Chapter 8 of the EIS. Nevertheless, a recent evaluation of impacts from a resumption of underground testing at the Nevada Test Site (DIRS 103273-Walck 1996) concluded that the only impact such testing would pose on the repository would be ground motion from the energy released by the detonations. DOE has determined that such effects would not exceed the seismic design criteria for the repository. In other words, the design-basis earthquake for the repository would generate stronger ground motions than would underground nuclear detonations on the Nevada Test Site. Because DOE has designed the repository to survive the design-basis earthquake with minimal damage, ground motion from the resumption of underground testing would be unlikely to result in substantial damage to the surface or underground facilities at Yucca Mountain.

Section 8.3.2.1.1 of the EIS describes the cumulative impacts of past nuclear weapons testing based on information in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). As stated in that EIS, DOE continues to perform tests at the Nevada Test Site including dynamic, hydrodynamic, and other tests as well as a small number of subcritical experiments using special nuclear materials. The Department has revised Chapter 8 to include a more complete description of these activities so the public and decisionmakers have a clear understanding of the potential cumulative impacts.

10 (258)
Comment - 27 comments summarized
Commenters said that the EIS failed to examine the cumulative health effects to people in Nevada from all past, present, and future exposures to radiation. Some said that residents of counties in eastern Nevada have been repeatedly exposed to radiation, beginning with fallout from above-ground nuclear testing and from DOE's failure to contain atmospheric releases during underground testing. Others said that residents are still being exposed through hiking, hunting, farming, and continuing fallout. Commenters said that DOE must evaluate the cumulative health effects (higher risk of latent cancers) of weapons testing, along with the health effects from the transport of all

radioactive materials through communities in eastern Nevada, including the effects of accidents. Others wanted to know what the impacts would be to current residents who were exposed to these past sources, as well as to residents who are genetically related to people who have been repeatedly exposed to radiation. Others wanted to know whether DOE examined the cumulative health effects to selected groups of people (pregnant women, children, elderly people, ethnic groups, etc.) from repeated exposure to radiation from all manmade and natural sources of radiation.

Response
As part of its analysis of cumulative impacts in Chapter 8, the Department quantified, where possible, the total radiation dose that local residents have received. The Department calculated the total risk to the population based on the conservative assumption that radiation risks from different exposures are additive.

With respect to person-specific exposures, the Department cannot account for each resident's past exposure to radiation. To do so would require accounting for person-specific lifestyles and habits, such as the frequency of cross-country airline flights, past residences in locations that might have substantially higher or lower cosmic radiation, and the frequency and nature of medical diagnostic tests and treatments. Instead, the Department used population risk factors (5×10^{-4} latent cancer fatality per person-rem for the public and 4×10^{-4} latent cancer fatality per person-rem for workers) based on the recommendations of the International Commission on Radiological Protection (DIRS 101836-ICRP 1991). These factors account for the variety of individuals in the population, including differences in risk due to age. An estimate of impacts to specific groups of people (such as pregnant women, children, the elderly, and certain ethnic groups) was not made because such estimates would have greater uncertainty. The doses that have been calculated thus far for downwind residents have uncertainty associated with them that would tend to overshadow differences in risk to the various groups cited. The use of the average risk factors adequately covers all groups within the population and gives a reasonable estimate of the risk to the group as a whole.

Section 8.3.2.1 of the EIS describes the activities on the Nevada Test Site that could contribute to cumulative impacts with the proposed repository. Section 3.1.8.2 estimates the annual radiation dose to a hypothetical individual in Springdale, Nevada (located eight miles north of Beatty), from airborne radioactive materials released during past testing of nuclear weapons at the Nevada Test Site. Since issuing the Draft EIS, DOE has revised the analyses of impacts associated with the Nevada Test Site. Sections and 8.2.2.2 and 8.4.2.7 now include information on radiation exposure from past nuclear weapons testing, and Section 8.3 includes updated estimates of future impacts to groundwater and air resources from activities on the Test Site. In addition, Section 8.4.2.7 incorporates the human health impacts from the transportation activities discussed in Section 8.4 (for example, Table 8-58 describes radiological and nonradiological impacts from waste transport between 1943 and 2047). Section 8.3 estimates the long-term future impacts to groundwater from potential migration of radiological and hazardous contaminants from the repository, the Nevada Test Site, and the Beatty low-level waste site.

As indicated in Section 3.1.8.2, DOE made quantitative estimates of the offsite doses from releases from past weapons testing at the Nevada Test Site. In response to public comments, Appendix J of the Final EIS contains maps showing routes used in analyzing impacts, and estimates radiological and nonradiological impacts for each state. This is in addition to the route maps that were in the Draft EIS (see Section 2.1.3.2 for national maps and Section 2.1.3.3 for Nevada maps).

Readers interested in more information about the effects of past testing of nuclear weapons should refer to the *National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans From Nevada Atmospheric Nuclear Bomb Tests* (DIRS 152469-Institute of Medicine and National Research Council 1999).

10 (335)
Comment - EIS000056 / 0001
The proposed repository is predicted to leak additional radioactive contamination into the aquifers in the southwestern portion of the Nevada Test Site...water that is currently potable will be contaminated if the DOE's Performance Assessment is correct. This will result in a significant adverse impact on the water resources that must be mitigated.

Response
DOE recognizes that some radionuclides or potentially toxic chemicals would eventually enter the environment outside the repository. However, modeling of the long-term performance of the repository shows that the combination of natural and engineered barriers at the site would keep such a release small enough to pose no serious impact to the health and safety of people or the environment. The releases would be well below the radiation protection standards established by the Environmental Protection Agency for a repository at Yucca Mountain [40 CFR Part 197].

The U.S. Geological Survey regional flow model (DIRS 100131-D'Agnese et al. 1997) suggests that some of the water from the Nevada Test Site flows southward toward the Amargosa Valley in the vicinity of Yucca Mountain. However, the actual transport times and groundwater pathways from potential radionuclide contaminants on the Site are not clearly known at this time. A "qualitative" calculation of the combined impact from the Nevada Test Site and Yucca Mountain in Section 8.3.2.1.1 indicates that the potential cumulative peak dose would be well below the Environmental Protection Agency's regulatory limits. This combined peak dose would occur only in the unlikely event that the peak concentrations from the Test Site and Yucca Mountain occurred at the same time and same location. See Sections 3.1.4.2.1, 5.4, and 8.3.2.1.1 of the EIS for more information.

10 (380)
Comment - EIS000044 / 0002
The results of Nye County's water resource evaluations found that the direct impacts of water withdrawals for the proposed repository will be limited to a localized lowering of water levels that was not deemed to be significant. However, the evaluation did find that the predicted leakage from the repository and the cumulative impacts of the proposed repository will indeed be significant and that mitigating measures must be implemented. The Draft Yucca Mountain EIS is inadequate with regard to its evaluation of impacts on water resources and corresponding mitigation and must be revised extensively.

The cumulative impacts on water resources will include the direct and indirect impacts of 1) the total radiological burden that will be imposed on Nye County; 2) the impacts of federal land withdrawals on water resource availability: 3) the impacts of federal policies regarding nuclear weapons testing, waste disposal, and environmental protection; and 4) the water resource use and management practices on both private and federal lands in the County.

The Department of Energy, through their selection of a reduced region of influence, limited their analysis to only the direct impacts of their water withdrawals from a single basin while ignoring documented impacts that occur over a much broader region. Further, the Department ignored other federally prepared reports that detailed the direct, indirect, and cumulative impacts of Department of Defense, Energy, and the Interior actions over the same region. This approach is inconsistent with the CEQ [Council on Environmental Quality] guidance for considering cumulative impact assessment under NEPA [National Environmental Policy Act] and with 40 CFR 1508.25.

All the Yucca Mountain EIS says with regard to cumulative impacts is that the potential impacts to groundwater would be small and limited to the immediate vicinity of the land disturbances associated with the action and that some minor incremental risk would occur from drinking the groundwater down gradient of the repository at some distant time in the future.

This approach is inconsistent with statements in the Draft EIS:

"The general path of water that infiltrates through Yucca Mountain is south toward Lathrop Wells, into and through the area around Death Valley Junction in the lower Amargosa Valley. Natural discharge of groundwater from beneath Yucca Mountain probably occurs farther south at Franklin Lake Playa." Vol. I, p. 5-23.

"The implementation of the proposed action could potentially affect the water supply in Death Valley National Park, which is downgradient from Yucca Mountain" Vol. II, Appendix C, page C-9.

The region of influence evaluated for cumulative impacts cannot be smaller than the region over which impacts are expected to occur. Thus, the Department's approach is inconsistent with the letter and intent of NEPA, CEQ guidance, and other federal documents including the EIS for the Nevada Test Site, and the Special Nevada Report.

If the Department of Energy chooses to continue to ignore the local perspective by not evaluating the impacts identified in the Nye County document and by other federal agencies, then it is imperative that Nye County's perspective be clearly documented in the EIS as an opposing viewpoint.

Response
Chapter 8 of the EIS analyzes reasonably foreseeable cumulative impacts to water resources from a repository at Yucca Mountain. The region in which the cumulative impacts could occur includes the entire groundwater flow system south of Yucca Mountain described in Section 3.1.4.2.1 of the EIS, as well as areas to the north on the Nevada Test Site that could contribute impacts to this groundwater flow system. In other words, the region examined for cumulative impacts is larger than the region examined for impacts from just the repository. In relation to short-term impacts to water resources, Section 8.2.3 describes the cumulative impacts from the Proposed Action and from additional inventories of nuclear waste. As stated in Section 8.2.3.2.2, no other Federal, non-Federal, or private actions in the affected area during the short term would have cumulative impacts with the Proposed Action, with one exception; cumulative impacts to groundwater resources from water demands of the Yucca Mountain Repository, along with groundwater demands from activities on the Nevada Test Site. Impacts to downgradient users in the Amargosa Desert from cumulative water demands for the repository and the Test Site, however, would be small compared to impacts from local pumping in the Amargosa Desert. With regard to long-term cumulative impacts to groundwater resources (those that could occur 10,000 years after closure of the repository), the Department limited the scope to cumulative impacts from the repository along with impacts from the Nevada Test Site and the Beatty low-level radioactive waste site (see Section 8.3).

The first cited quote in the comment, from Section 5.3 of the EIS, is accurate. A fraction of the groundwater might flow through fractures in the relatively impermeable Precambrian rocks in the southeastern end of the Funeral Mountains toward spring discharge points in the Furnace Creek area of Death Valley. Sparse potentiometric data indicate that a divide could exist in the Funeral Mountains between the Amargosa Desert and Death Valley. Such a divide would limit discharge from the shallow flow system, but not necessarily affect the deeper carbonate flow system that might contribute discharge to the Furnace Creek area. Even if part of the flow from Yucca Mountain mixed into the carbonate pathway that supplies the Furnace Creek springs, it would be too little to have a noticeable effect on the chemistry of the springs. Considering the small fraction of water that would infiltrate though the repository area (approximately 0.3 percent or less) compared to the total amount of water flowing through the basin and the large distances involved [more than 60 kilometers (37 miles) from the source], any component of the flow from Yucca Mountain in this very long and complicated flowpath would be diluted to such an extent that it would be indistinguishable.

The second quote in the comment is consistent with the Department's conclusion that some minor incremental risk would occur from ingesting groundwater downgradient of the repository at some distant time in the future. The main point of Appendix C is to summarize interactions with organizations that have an interest in, or authority over, land that the Proposed Action could affect, such as the National Park Service, which manages the Devils Hole Protective Withdrawal and Death Valley National Park. DOE and National Park Service officials held discussions during which time the Department addressed Park Service concerns about water use for repository construction and operation.

Finally, DOE did consider planning and other documents from Federal, state, and local agencies in determining future actions that are reasonably foreseeable that could have impacts that are cumulative with the Proposed Action. With regard to the *Special Nevada Report* (DIRS 153277-SAIC 1991), Section 8.2 of the Final EIS describes this report and the reasons why DOE did not use the analysis in that report.

10 (421)
Comment - EIS000071 / 0019
Nye County, by virtue of its location, characteristics and overwhelming federal presence has been disproportionately impacted by past, present and continuing federal action.

Nye County must receive just equity offsets, mitigation and compensation from the United States to mitigate the cumulative impacts of these past, present actions and the proposed repository should it go forward.

Nye County's analysis and evaluations arrange direct, indirect cumulative and direct cumulative have been identified in areas of land use, water resources, lost economic opportunity, perceived risks, stigma and others.

Nye County believes that these impacts, although adverse and significant, can be mitigated through various measures.

Response
Impacts of the Proposed Action, along with other past, present, and reasonably foreseeable actions that are spatially and temporally related to impacts of the proposed repository, are discussed throughout Chapter 8 of the EIS. These other actions include, among others, activities at the Nevada Test Site, the Beatty waste-disposal site, and Nellis Air Force Range (now called the Nevada Test and Training Range).

Based on its method of analysis in Chapter 8, the Department believes that it has accounted for all past, present, and reasonably foreseeable actions in Nye County that could meaningfully contribute to cumulative impacts with the repository.

After the Draft EIS was published, the Department reviewed the activities in the region of influence that could contribute to cumulative impacts. Chapter 8 of the Final EIS includes a more detailed discussion of cumulative impacts related to projected water use for the repository and water availability and water rights issues in Nye and surrounding counties.

The Department is not considering mitigation of cumulative impacts that are unrelated to the proposed repository.

Section 116 (c) of the NWPA establishes a procedure, unrelated to this EIS, by which affected units of local government, such as Nye County, can report effects from the proposed repository to DOE. Affected units of local government can receive impact assistance upon agreement with DOE on the nature and severity of the impacts. Section 116(c) commits DOE to participate in this procedure and to provide assistance consistent with direction from Congress.

10 (437)
Comment - EIS000080 / 0008
You're looking at radioactivity and the risks associated with exposure to radioactivity. There's a little thing out here called toxicity and you only look at the toxicity of the non-radioactive constituents.

The radioactive constituents also have a toxicity and a risk associated with that toxicity, so if you want to look at the total risk to Amargosa Valley over the coming decades, you've got one, the risk of the naturally occurring uranium in the water up north of [U.S.] 95; two, the risk of the migration of tritium and other contamination off of the Nevada Test Site; three, the toxicity of the materials on the Test Site; four, any contributions from radionuclides coming from Yucca Mountain; and five, the toxicity of those.

The EIS does not cover all of those. It only looks at the radioactivity from Yucca Mountain and it needs to be revised to incorporate the entire suite of what is out there.

Response
The five items mentioned in the comment are characterized in Section 3.1.8.2 of the EIS and various sections in Chapter 8, particularly Section 8.3.2.

DOE realizes that radionuclides have chemical properties that could present an additional toxicity risk. For this reason, the Department considered the chemical toxicity of radionuclides in the screening criteria used for the long-term performance assessment, as discussed in Section I.3.2 of the EIS. Section 8.3 discusses the cumulative impact to groundwater of long-term releases from the Nevada Test Site and the proposed repository.

10 (475)
Comment - EIS000069 / 0007
Once this material arrives, we will have it here forever. We suggest that this document does not adequately address the issue of cumulative impacts that this county, Nye County has had to bear from a number of federal agencies; not

just a nuclear community, but we have huge presence with federal land management agencies, national parks, National Fish and Wildlife, Bureau of Indian Affairs and other federal agencies, all of them wanting to come to Nye County and manage the resources and none of them talking to each other. The United States must deal with this issue in a fair and equitable way and must deal effectively with the actual as well as the perceived risks.

Response
Based on available information, DOE analyzed the potential cumulative impacts to current and future populations surrounding the proposed repository at Yucca Mountain. Chapter 8 of the EIS contains this information. The Department realizes that, as in other communities in our country, many activities take place in Nye County. Not all of these activities, however, have had or would have cumulative impacts with the proposed repository.

During scoping for the EIS, DOE received comments on the need to address perception-based and stigma-related impacts that could arise from the construction and operation of a repository, and from the transportation of spent nuclear fuel and high-level radioactive waste. In considering these comments, DOE recognized that nuclear facilities could be perceived to be either positive or negative, depending on the underlying value systems of the individual forming the perception. Perception-based impacts would not necessarily depend on the actual physical impacts or risks from repository operations or transportation. Further, people do not consistently act in accordance with negative perceptions, so the connection between public perception of risk and future behavior would be uncertain or speculative at best. For these reasons, DOE determined that including analyses of perception-based and stigma-related impacts in the Draft EIS would not provide meaningful information.

However, in light of the comments received on the Draft EIS on this subject, DOE examined relevant studies and literature on perceived risk and stigmatization of communities to determine whether the state of the science in predicting future behavior based on perceptions had advanced sufficiently since scoping to enable DOE to quantify the impact of public risk perception on economic development or property values in potentially affected communities. Of particular interest were those scientific and social studies carried out in the past few years that relate directly to either Yucca Mountain or to DOE actions such as the transportation of foreign research reactor spent nuclear fuel. DOE also reevaluated the conclusions of previous literature reviews such as those conducted by the Nuclear Waste Technical Review Board and the State of Nevada, among others. DOE has concluded that:

- While in some instances risk perceptions could result in adverse impacts on portions of a local economy, there are no reliable methods by which such impacts could be predicted with any degree of certainty.

- Much of the uncertainty is irreducible.

- Based on a qualitative analysis, adverse impacts from perceptions of risk would be unlikely or relatively small.

While stigmatization of southern Nevada can be envisioned under some scenarios, it is not inevitable or numerically predictable. Any such stigmatization would likely be an aftereffect of unpredictable future events, such as a serious accident, which might not occur. As a consequence, DOE addressed but did not attempt to quantify the potential for impacts from risk perceptions or stigma in this Final EIS. See Section 2.5.4 and Appendix N for more information.

10 (524)
Comment - EIS000105 / 0001
The cumulative impacts on water resources will include the direct and indirect impacts of the total radiological burden that will be imposed on Nye County, the impacts of federal land withdrawals on water resource availability, the impacts of federal policies regarding nuclear weapons testing, waste disposal and environmental protection and the water resource use and management practices on both private and federal land in the county.

The Department of Energy limited their cumulative analysis to the Jackass Flats hydrographic basin and limited their analysis to only the direct impacts of their water withdrawals from that basin.

This approach is inconsistent with the CEQ [Council on Environmental Quality] guidance for considering cumulative impact assessment under NEPA [National Environmental Policy Act].

Response
In general, the analysis of cumulative impacts in Chapter 8 followed the process recommended in the Council on Environmental Quality's handbook *Considering Cumulative Effects Under the National Environmental Policy Act* (DIRS 103162-CEQ 1997). This process included the identification, through research and consultation, of Federal, non-Federal, and private actions with possible effects that would be coincident with those of the Proposed Action on resources, ecosystems, and human communities.

Chapter 8 of the EIS analyzes reasonably foreseeable cumulative impacts to water resources. In relation to short-term impacts to water resources, Section 8.2.3 describes the cumulative impacts from the Proposed Action and from additional inventories of nuclear waste. As stated in Section 8.2.3.2.2, no other Federal, non-Federal, or private actions in the affected area during the short term would have cumulative impacts with the Proposed Action, with one exception; cumulative impacts to groundwater resources from water demands by the Yucca Mountain Repository, along with groundwater demands from activities on the Nevada Test Site. Impacts to downgradient users in the Amargosa Desert from cumulative water demands for the repository and the Nevada Test Site, however, would be small compared to impacts from local pumping in the Amargosa Desert.

In relation to long-term cumulative impacts to groundwater resources (those that could occur 10,000 years after closure of the repository), the Department determined that the analysis of cumulative impacts from the repository should include impacts from the Nevada Test Site and the Beatty low-level radioactive waste site (see Section 8.3). In addition to considering cumulative radiological impacts to the Jackass Flats hydrographic basin, DOE also considered the primary discharge point for groundwater flowing beneath Yucca Mountain, which it believes to be Franklin Lake Playa. Groundwater reaching this area could, over the long term, contain small amounts of radioactive and hazardous materials from the repository, the Nevada Test Site, and the Beatty low-level waste site, as described in Section 8.3.2 of the EIS. Furthermore, the EIS recognizes that some groundwater reaching this far might bypass Franklin Lake Playa and continue to Death Valley, and that a very small amount of this groundwater beneath the Amargosa Desert might flow toward springs in the Furnace Creek Wash area of Death Valley. DOE expects that impacts to people and the environment of Death Valley would be negligible.

DOE has revised Sections 8.2.1 and 8.2.3.2 of the EIS to further explain potential cumulative impacts of land withdrawals on water resources. In relation to policies on weapons testing, the EIS uses information from the Expanded Use Alternative in the Nevada Test Site EIS (DIRS 101811-DOE 1996), which allows for weapons testing under a "supreme national interest." Several sections of the EIS discuss the impacts of waste management; for example, Section 8.2.12 discusses the management of waste generated at the repository, and Section 8.4 discusses impacts of waste transportation.

10 (893)
Comment - EIS000410 / 0001
I do not believe that a reasonable conclusion can be drawn from a study which does not include a comparison study of the radiation which already exists. While I am no physicist, it would be hard to convince me that the radiation from over 110 above-ground tests and 1,100 underground tests (+/- a few hundred) set off in shafts which were 5,000 to 15,000 feet deep over a period of 30 years has not already contaminated the ground and the water in unimaginable proportions for miles around.

I believe that the following questions need to be answered before your department can come to a reasonable conclusion - and inform the public of what already exists at Yucca Mountain and surrounding area:

1. Exactly how many nuclear tests were conducted, both above and below ground, and their exact proximity to population and water.

2. The depth of underground tests, and how they have already affected the water table.

3. Quantify the radiation which exists there now, both above and below ground, its potential life expectancy, comparing it to the proposed waste dump.

4. Conditions which exist from the testing which would affect workers at the project.

5. A complete public airing of all information concerning the detonations at the site, including any information considered classified by the military, insofar as radioactive contamination is concerned - I do not believe the military or DOE has the right to keep that sort of information secret.

Response
DOE described past activities at the Nevada Test Site in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). Chapter 8 of the repository EIS discusses the cumulative impacts of the repository along with past, present, and reasonably foreseeable future actions at the Nevada Test Site, Nellis Air Force Base, the Beatty low-level radioactive waste disposal site, and other non-Federal actions in the affected area (see Table 8-1). Section 8.3.2.1 describes possible impacts to groundwater quality from activities on the Nevada Test Site, including past weapons testing.

The five specific questions raised by the commenter are addressed to varying degrees in DIRS 101811-DOE (1996) and in Section 8.3.2.1 of the EIS. In brief, 821 underground and 100 atmospheric detonations have been conducted at the Nevada Test Site. The areas where these tests were conducted are shown on Figure 3-2 of the EIS and Figure 4-22 of DIRS 101811-DOE (1996). Many underground tests were conducted near and below the water table; contaminant migration from these points of detonation has been negligible. Total radioactivity is estimated to be more than 300 million curies, as cited in Table 8-55 of the EIS. Some of this material is long-lived, some is short-lived, but it will be there for the long term, not unlike the material that would be placed in the proposed repository. There are no known "conditions" caused by weapons testing that would affect workers at Yucca Mountain. Finally, DOE is obligated to comply with laws of the United States regarding the release of classified information.

10 (981)
Comment - EIS000242 / 0002
Nye County has found that the Department of Energy has not adequately addressed the cumulative impacts, that the proposed repository on the resources, ecosystems, or the human communities of Nye County.

The impacts of past federal actions, including the existing residual contamination from the conduction of more than 900 nuclear tests at the Nevada Test Site, have sacrificed the groundwater resources under more than 250 square miles of Nye County.

The withdrawal of lands from public use for the Nevada Test Site for the Nevada test and training range, part of the Nellis Range Complex, and the federal management of millions of acres of national parks, forests, and wildlife refuges have resulted in lost opportunities from those lands for the residents of the county.

Because of its location and characteristics, Nye County and its residents have been disproportionately impacted by past and present federal actions. Yucca Mountain will significantly add to these impacts, yet this draft EIS portrays to the decision maker that the Yucca Mountain Project is just another casual federal action with no more impact than clearing a road through a forest. Nothing could be further from the truth.

Response
Chapter 8 of the EIS analyzes a reasonable range of past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts. In preparing this chapter, DOE reviewed many documents to determine where there was potential for cumulative impacts. These documents included resource plans, EISs, environmental assessments, tribal meeting records, and other documents prepared by Federal, state, local, and private organizations.

Section 8.3.2.1.1 of the EIS discusses the potential long-term impacts on groundwater from past weapons testing at the Nevada Test Site. This analysis does not show that groundwater resources have been sacrificed underneath Nye County.

The Department understands that large tracts of land have been withdrawn from public use in southern Nevada and adjoining parts of California for reasons of national defense and environmental protection. Section 8.2.1 now includes a more detailed discussion of potential cumulative impacts from land withdrawals by Federal agencies.

10 (1119)
Comment - EIS000225 / 0005
The document fails to address the broad scope of impacts on the 1,500 people who live spread over 200 square miles in the area. There needs to be further examination of cumulative impacts such as existing subsurface contamination at the nearby Nevada Test Site, disposal of low-level radioactive waste in the county and other federal uses of land by such agencies as the Defense Department, the U.S. Forest Service and the Bureau of Land Management.

Response
Chapter 8 of the EIS discusses the impacts of the repository along with the impacts from past, present, and reasonably foreseeable future actions that could affect this area. In preparing this chapter, DOE reviewed many documents to determine where there was potential for cumulative impacts. These documents included resource plans, EISs, environmental assessments, strategic plans, consultation documents, tribal meeting records, and other documents prepared by Federal, local, and private organizations. The analyses and results described in Chapter 8 consider only those activities with a potential for cumulative impacts with the repository.

10 (1135)
Comment - EIS000270 / 0020
Factors that give rise to public concerns about and opposition to approval of the Yucca Mountain site include:

Failure to account for additive sources of contamination from nearby areas, including but not limited to spread of radioactivity and hazardous materials or wastes from the Nevada Test Site and Nellis Air Force Base, or for future potential additional pollution sources in adjoining areas.

Response
Chapter 8 of the EIS describes the cumulative impacts from a repository, along with past, present, and reasonably foreseeable future actions at the Nevada Test Site, Nellis Air Force Base, the Beatty low-level radioactive waste disposal site, and other non-Federal actions in the affected area (see Table 8-1). In preparing Chapter 8, DOE reviewed many documents to determine the potential for cumulative impacts. These documents included Federal resource management plans, reports provided by the State of Nevada, environmental impact statements and assessments, and records of tribal meetings. Except for some factual changes and clarifications that have been included in the Final EIS, DOE believes that the Draft EIS adequately characterized the cumulative impacts associated with the proposed repository.

10 (1168)
Comment - EIS000119 / 0010
Federal agencies, including the DOE, the BLM [Bureau of Land Management], US Forest Service, the National Park Service, the United States Air Force, the United States Navy, the Bureau of Indian Affairs and US Fish and Wildlife Service have repeatedly failed to fulfill their obligations under NEPA [National Environmental Policy Act] by refusing to acknowledge such impacts [cumulative] in their NEPA reviews and provide the mitigation measures that are appropriate.

Nye County's analyses and evaluations identified a range of direct and indirect cumulative impacts in areas such as transportation, land use, water resources, lost economic opportunity and others.

The county believes that these are adverse and significant impacts and that they must be mitigated through various measures.

With the cessation of nuclear weapons testing in 1992, Nye County has made substantial efforts to plan for its economic future in the US 95 corridor.

The EIS does not recognize these plans and it does not reflect an obligation by DOE to ensure that this proposal will not thwart those plans.

Nye County by virtue of its location, characteristics and its overwhelming federal presence has been disproportionately impacted by past, present and continuing federal actions.

Nye County must receive just equity offsets, mitigation, and compensation from the United States to mitigate the cumulative effects of these past and present actions and the proposed repository should it go forward.

Response
Impacts of the Proposed Action, along with other past, present, and reasonably foreseeable actions that are spatially and temporally related to impacts of the repository, are discussed throughout Chapter 8 of the EIS. These other actions include, among others, activities at the Nevada Test Site, the Beatty waste-disposal site, and Nellis Air Force Range. Based on its method of analysis in Chapter 8, the Department believes that it has accounted for all past, present, and reasonably foreseeable actions in Nye County that could meaningfully contribute to cumulative impacts with the repository.

After publishing the Draft EIS, DOE reviewed activities in the region of influence and updated information in the Final EIS where appropriate. Chapter 8 of the Final EIS includes a more detailed discussion of cumulative impacts related to water use at the repository and water availability and water rights issues in Nye and surrounding counties.

The Department is not considering mitigation of cumulative impacts that are unrelated to the proposed repository.

10 (1723)
Comment - EIS000578 / 0001
I'd like to convey my concerns about what I think is a huge void in this whole Environmental Impact Statement, and that is the fact of addressing what's already there. I think it's important to know that. I don't think any of us would be here if it wasn't for the fact that that place had about 1500 or so, give or take a hundred, nuclear bombs blown up down there, and it's my opinion that the place is probably the most irradiated place on the planet now.

My concern is that there have been I think 1200 underground tests down there. We're all concerned about the water tables. I know a person personally who helped drill some of the holes they blew the bombs off in. They were a mile deep. If they didn't get through three or four water tables by then, I think we're dreaming.

So what I would like to know is if any tests or any environmental study has ever been done to figure out what is there now, and is this study being done so we'll know relatively, I mean, how much more could we screw up the place versus what is already there.

Nobody ever talks about it. I very rarely hear anything about this in the news, in the media. I have been to a couple of these meetings. Nobody really ever talks about that.

I think we have got military and that entity of government not transmitting information to you folks who I think need it. And I would like to know because I think that the place is already contaminated. I'm not in favor particularly of having any more come there, but my concern is knowing what's already there.

I think we have got our heads buried in the sand when it comes to knowing anything at all about what's there already. And I don't know how we can even approach this particular study without knowing what already exists there, and I don't think you can make a rational decision about anything until we know, and just as a citizen, I'd like to know.

Response
DOE described past activities at the Nevada Test Site in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). Section 8.3.2.1 of the Draft EIS discussed the activities at the Nevada Test Site and acknowledged the potential for large amounts of radioactivity as a potential long-term impact. In the Final EIS the Department has updated the information based on more recent analyses of the potential long-term impacts from these activities.

In 1998, the Department published *Accelerating Cleanup: Paths to Closure* (DIRS 107294-DOE 1998) and has continued to update that report with supplemental information to present the status of cleanup efforts in the DOE complex. The report estimated a total cost of less than $3 billion (DIRS 107294-DOE 1998) for all projects at the Nevada Test Site. In addition to cleanup and remediation activities, this estimate includes subsurface monitoring and surveillance of the sites for up to 100 years (DIRS 107294-DOE 1998).

The Department is continuing environmental restoration at the Nevada Test Site and is studying and monitoring groundwater contamination of the underground test areas. No long-term plans for remediating the underground test areas have been developed.

10 (1777)
Comment - EIS000392 / 0002
Cumulative effects: The DEIS fails to examine all of the past and reasonably foreseeable actions discussed for cumulative impacts. Specifically the impacts of low level radioactive waste transportation to the Nevada Test Site (NTS) are ignored. Issues such as land withdrawal, water resources, cultural resources, socioeconomic impacts and environmental justice have received inadequate analysis.

Response
Section 8.4 of the EIS discusses the cumulative impacts of waste transport to a repository at Yucca Mountain along with shipments of low-level radioactive waste to the Nevada Test Site. Sections 8.2 and 8.3 describe other possible cumulative impacts. Since the publication of the Draft EIS, DOE has revised some of these analyses and believes that the Final EIS presents a reasonable estimate of the cumulative impacts that could be expected in the region.

10 (1792)
Comment - EIS000630 / 0009
Military air space impacts. Also absent from the EIS was the adequate analysis of the cumulative impacts and the potential conflicts between the military air space practice areas, the ranges to the south, and the rail route.

Response
Section J.3.3 in the EIS describes the scenarios considered in the evaluation of transportation accidents, which included military airspace operated by the U.S. Air Force.

10 (1808)
Comment - EIS000332 / 0007
DOE fails to include reasonably foreseeable action proposals identified in other federal, state, and local documents (e.g., many DOI [Department of the Interior] actions are not included; Las Vegas Valley Water District water right applications are not included). DOE also relies upon analyses performed by other agencies where such agencies failed to identify impacts to Nye County and its resources, even when Nye provided supporting analyses and documentation through the agencies' administrative process.

Response
Chapter 8 of the EIS evaluates the cumulative impacts of the repository along with the impacts of other Federal, non-Federal, and private actions. If the impacts from the repository would not interact or somehow overlap in time or space with impacts from these other actions, DOE did not include them in the assessment of cumulative impacts. The commenter suggests that actions by the Department of the Interior and the Las Vegas Valley Water District should have been included in the assessment of cumulative impacts. However, the water rights applications filed by the Las Vegas Valley Water District are not within the groundwater basins potentially affected by the repository. Actions by the Department of the Interior that could have cumulative impacts with the Proposed Action are described in Section 8.1.2.2 of the EIS.

The commenter suggests that DOE relied upon analyses by other agencies where such agencies fail to identify impacts to Nye County, even when Nye County provided supporting analyses and documentation through the agencies' administrative processes. DOE cites analyses performed by other agencies when they provide insight to or a context for the Proposed Action. Whether these analyses reflect Nye County's input is not germane to the Department's use of documents. On the other hand, DOE has documented opposing viewpoints and analyses in the EIS. DOE included these views if they were based on scientific, regulatory, or other information supported by credible data and analytical methods. For example, opposing views on the nature of the groundwater system at Yucca Mountain are discussed in Section 3.1.4.2.2. Opposing views on other subjects are discussed elsewhere in this EIS.

10 (1815)
Comment - EIS000332 / 0013
With the cessation of nuclear weapons testing in 1992, Nye County has made substantial efforts to plan for its economic future in the US-95 corridor. The DEIS does not recognize these plans, and does not reflect a DOE obligation to ensure that the YMP [Yucca Mountain Project] will not thwart those plans. Nye County, by virtue of its location, characteristics, and overwhelming federal presence has been disproportionately impacted by past, present, and continuing federal actions. Nye County must receive just equity offsets, mitigation, and compensation from the U.S. to mitigate the cumulative [impacts] of these past and present actions, and the proposed repository, should it go forward.

Through Nye County's analyses and evaluations, a range of direct and indirect cumulative impacts have been identified (land use, water resources, lost economic opportunity, and others). Nye County believes that these impacts, although adverse and significant, can be mitigated through various measures.

Nye County will present its technical basis and evaluations to support the position that impacts stemming from the implementation of the proposed action can be mitigated, and will continue to request mitigation pursuant to NEPA [National Environmental Policy Act].

Response
Consistent with regulations of the Council on Environmental Quality (40 CFR 1508.7), DOE considered past, present, and reasonably foreseeable actions in its assessment of cumulative impacts and has reviewed a number of actions both current and proposed to determine their relevance. The expression "reasonably foreseeable" refers to future actions for which there is reasonable expectation that the action could occur, such as a proposed action under analysis, a project that already started, or a future action that has obligated funding.

DOE structured the cumulative impact assessments in Chapter 8 of the EIS by identifying actions the effects of which could coincide in time and space with the effects from the proposed repository and associated transportation activities.

The identification of the relevant actions was based on reviews of resource, policy, development, and land use plans prepared by agencies at all levels of government and from private organizations, other environmental impact statements, environmental assessments, and tribal meeting records. Consistent with regulations of the Council on Environmental Quality [1502.16(c) and 1506.2], in addition to the assessment of potential environmental impacts, the potential conflicts with plans issued by various entities were considered to the extent they provided relevant information.

The commenter indicated that Nye County would present its technical basis and evaluations to support their position that impacts from the Proposed Action can be mitigated. DOE would consider this information, when it is available, and would develop appropriate mitigation actions consistent with the Council on Environmental Quality regulations (40 CFR Parts 1500-1508) and Section 116(c) of the NWPA. Chapter 9 of the EIS identifies DOE-determined impact reduction features, procedures and safeguards, and mitigation measures under consideration for inclusion in the project plan and design. Chapter 9 also identifies ongoing studies that could eventually influence mitigation measures related to the project plan and design.

10 (2227)
Comment - EIS000622 / 0011
There is also no cumulative figures that I could find regarding the fact that this is being built adjacent to the Nevada Nuclear Test Site. The Nevada Nuclear Test Site is already exposing everyone in the area through the air, through soils that blow around in high level winds, through the water, and there's not information about how this would cumulatively affect people in terms of genetics, natural wildlife or human health. I think this is inadequate and needs to be addressed with a lot more concern.

Response
Table 8-1 of the EIS lists the past, present, and reasonably foreseeable actions that DOE analyzed in Sections 8.2, 8.3, and 8.4 for cumulative impacts. Activities at the Nevada Test Site that would affect the cumulative impact analyses included past nuclear weapons testing; treatment, storage, and disposal of low-level radioactive waste,

mixed waste, transuranic waste, high-level radioactive waste, and hazardous waste; construction and operation of an intermodal transfer station near Caliente for the shipment of low-level radioactive waste to the Nevada Test Site; historic shipments of radioactive materials to and from the Nevada Test Site for other DOE facilities; and possible future shipments of radioactive materials to the Nevada Test Site. DOE believes that it has considered all past, present, and reasonably foreseeable actions on the Nevada Test Site in the cumulative impact analyses in Chapter 8.

10 (2330)
Comment - EIS000614 / 0015
The following issue needs to be addressed and thoroughly analyzed concerning direct impacts to Lander County in a detailed manner: military overflights and other federal agency interactions.

Response
DOE did consider the potential impacts of military overflights in its analysis of the proposed Yucca Mountain Repository. Section J.3.3, for example, describes potential transportation accidents associated with military operations from Nellis Air Force Base. As described in Section 8.1.2.2, the Department also considered other Federal activities in the region.

10 (2761)
Comment - EIS000897 / 0002
Will radiation sources in the area, other than the repository, be considered in a total dose calculation? Will the recently reported spent fuel buried somewhere in Area 25 of the Nevada Test Site be included? What about the cumulative impacts to groundwater from nuclear testing?

Response
The EIS discusses possible radiological sources other than the repository in Chapter 8. The cumulative impacts of such actions would not always be directly additive, however, due to spatial differences in the sources, time differences in potential releases, and differing transport mechanisms. For instance, the maximally exposed individual dose from airborne emissions from a particular facility would not be additive to the maximally exposed individual dose from the repository because the calculations are for two different locations. Therefore, DOE has quantified the impacts given such differences among the various potential sources of radiological emissions.

Section 8.3.2.1 describes the activities on the Nevada Test Site that could contribute to cumulative impacts with the proposed repository. Since issuing the Draft EIS, DOE has revised some of the analyses of impacts associated with the Nevada Test Site. Sections 8.2.2.2 and 8.2.7 now include information on radiation exposure from past nuclear weapons testing, and Section 8.3 includes updated estimates of future impacts to groundwater and air resources from activities on the Test Site.

There are no known sites in Area 25 where spent nuclear fuel has been buried. Parts from the old nuclear rocket program, and perhaps some fuel from this program, might be buried somewhere in Area 25, but nothing definite is known about the nature of the material or where it might be buried. This material was not accounted for in the cumulative impacts analysis because its existence, location, amount, and characteristics are not known.

10 (3004)
Comment - EIS000692 / 0005
I would like to say that it is almost laughable to any Nevada citizen that the DOE seriously claims to be taking cumulative impacts into consideration in the final choice between a Yucca Mountain repository and the two no action scenarios.

One look at the cumulative impacts evaluated sheet of your presentation should be enough to disqualify Yucca Mountain from further study.

Response
DOE has prepared this EIS so the Secretary of Energy can consider it, together with other factors required by the NWPA, in making a determination whether to recommend Yucca Mountain for development as a repository, rather than to present a choice between the Proposed Action and the No-Action Alternative.

DOE believes that Chapter 8 of the EIS provides a credible discussion of the cumulative impacts from the repository, along with the impacts of past, present, and reasonably foreseeable activities in the region. These discussions include short- and long-term cumulative impacts of the repository, the cumulative impacts of transportation, and the cumulative impacts of manufacturing disposal containers and shipping casks.

10 (3092)
Comment - EIS000706 / 0005
Despite [the key role of Clark County] there is almost no evaluation of the potential implications of transporting nuclear waste through our urbanized, congested and increasingly developing valley.

The DEIS also fails to evaluate cumulative impacts associated with other Nevada Test Site activities. As an example, there is no examination of the probable use of the Nevada Test Site as the disposal site for the nation's low level radioactive waste. This offers the potential to dramatically increase the total numbers of shipments through Clark County and Southern Nevada.

Response
Section 8.4 of the EIS discusses the cumulative impacts of transportation in the region, and includes the impacts of shipping a wide variety of nuclear materials. DOE examined many documents to determine the likely number of waste shipments in the region and the resultant impacts. For all the actions identified in Section 8.4, the Department described the radiological impacts and the impacts from vehicle accidents.

Section 8.2.12.2 discusses the cumulative impacts from the storage of low-level waste, which includes the reasonably foreseeable action of the Nevada Test Site becoming a regional low-level waste-disposal site.

10 (3990)
Comment - EIS000724 / 0005
Another problem with the DEIS is that there is no way to discover the total risk associated with the Yucca Mountain Project. The DEIS should clearly spell out what the accumulation of all the possible impacts could be, especially for the residents of southern Nevada. For instance, what if I were born near Yucca Mountain and I grew up drinking contaminated water and eating contaminated food? What if I am an involved worker at Yucca Mountain and I become pregnant and nurse my child? How can I determine from reading the DEIS what the total risk is to myself and my child? Or, what if I am a truck driver who transports casks from the east coast to Yucca Mountain, and I live along the transportation route and my partner is a crossing guard at one of the intersections on the transportation route, and we have a child who attends a school on the route. How can I determine our total risk as a family?

Response
DOE is not able to calculate past and future doses to each resident in the region. To do so would require accounting for lifestyle habits such as cross-country airline flights, past residence in locations that might have substantially higher or lower background cosmic radiation, medical diagnostic tests and treatments, etc. However, the Department has calculated the impacts to various receptor groups in Chapters 4 through 8, which provide a reasonable estimate of radiation doses. These groups include involved radiation workers, noninvolved workers, members of the public exposed along the transportation route, and members of the public in the vicinity of the proposed repository. To estimate impacts, individuals could identify the appropriate receptor group or groups to which they belong and add the impacts for individuals in those groups. For example, if an individual was a noninvolved worker and lived near the repository, that person would be in two receptor groups: the general public and the noninvolved worker group. This would provide a first-order approximation of the total radiation dose to that individual.

10 (4206)
Comment - EIS001160 / 0022
The DEIS does not adequately address issues raised and substantiated by White Pine County during the scoping process. For example:

The repository EIS must consider the possibility that U.S. Highways 93 and 6 and State Highway 318 through White Pine County will be used for both high-level and low-level radioactive waste [LLRW] shipments. Alternatives considered within the EIS should consider with and without LLRW shipments along highway access options

through White Pine County. The DEIS does not consider the cumulative impacts (radiological, socioeconomic, etc.) of shipments of HLW [high-level radioactive waste] and LLW through White Pine County.

Response
Under regulations issued by the U.S. Department of Transportation (49 CFR 397.101), truck shipments of spent nuclear fuel and high-level radioactive waste could not use a route through White Pine County. Therefore, an analysis of cumulative impacts is not necessary. However, Appendix J of the EIS evaluates the sensitivity of impacts to variations in routing through Nevada. For comparison purposes, Section J.3.1.3 considers a route through White Pine County, but this route would not be used.

10 (4555)
Comment - EIS000225 / 0006
Nye County consultant Thomas Buqo and Steve Frishman, a consulting geologist with the State Nuclear Projects Agency, questioned calculations by Yucca Mountain Project scientists that show the radioactive inventory after 1,000 years of waste storage would be 120 million curies, or units of radioactivity. That amount is less than half the current burden of 300 million curies left from below-ground nuclear tests at the Nevada Test Site. Frishman said the Yucca Mountain inventory would be at least 4 billion curies after 1,000 years of decay, potentially adding more contamination to ground water supplies in Nye County than from what exists now as a result of full-scale U.S. nuclear weapons.

Response
DOE is not aware of the origin of the 120-million-curie estimate provided by the commenter. Table A-10 in the EIS provides the estimated curies of each radionuclide projected for disposal in the repository. If one added the amounts of each radionuclide in the list, the total would be approximately 14 billion curies. This is the estimate of the number of curies of various radionuclides at the time of receipt at the repository. By considering the radioactive decay of the radionuclides for 1,000 years, the radionuclide inventory remaining in the mountain at that time would be approximately 140 million curies.

It appears that the commenter might be referring to the number of kilograms of uranium projected for Modules 1 and 2, which was listed as 120 million in Table 8-36 of the Draft EIS. This figure was used to evaluate the potential for uranium (evaluated here for its chemical toxicity as opposed to its radioactivity) to affect the offsite drinking water, along with any other chemically toxic materials that could dissolve in the groundwater (see Section 8.3.1.1 of the EIS).

DOE recognizes, and the EIS acknowledges, that the radioactivity stored in the repository would be greater than the radioactivity that is currently estimated at the Nevada Test Site. However, the quantity of activity alone is not the sole indicator of risk. As described in the EIS, the repository would be an engineered facility designed to contain the material placed in it over very long periods. This is very different from underground detonation sites at the Nevada Test Site where the radioactivity is not in a facility designed for long-term containment.

10 (4570)
Comment - EIS001521 / 0084
Page 8-35, fifth paragraph--the 15,000 acre-feet per year reference should be to page 3-40, Table 3-11 (not Table 3-10), and the correct withdrawal amount is 14,000 acre-feet (not 15,000 acre-feet as stated).

Response
The comment is correct, and DOE has revised the EIS accordingly.

10 (4610)
Comment - EIS001430 / 0008
Page 8-74, 2. incorrectly states that Figure 8-3 (p. 8-11) shows the locations of underground nuclear tests.

Response
Thank you for your comment. DOE has changed the text to refer to the appropriate figure.

10 (4611)
Comment - EIS001430 / 0009
Page 8-7, bullet 2 has different numbers of waste packages given than in Table 8-34 (p. 8-60).

Response
Thank you for your comment. The Department has changed the reference in bullet two to refer correctly to the actual number of waste packages listed under the reference "DIRS 102030-CRWMS M&O 1999."

10 (4749)
Comment - EIS001450 / 0010
There are several problems where words state that a figure or table shows something that it doesn't, as noted below:

a. Page 8-7 — the text in the second bullet gives different (and lower) ranges for the number of waste packages than the totals for each category in referenced Table 8-34 (page 8-60).

b. Page 8-74, activity 2 — this description incorrectly states that Figure 8-3 (page 8-11) shows the locations of underground nuclear tests; the location of the nuclear and high explosive test zones are, however, shown on Figure 3-2 (page 3-8).

Response
DOE has changed the text in the Final EIS as follows: (a) the reference in bullet 2 was changed to refer correctly to the actual number of waste packages that are listed under the reference "DIRS 102030-CRWMS M&O 1999"; and (b) the reference to Figure 8-3 was changed to the correct figure.

10 (5167)
Comment - EIS001910 / 0006
The Draft EIS does not go far enough to address cumulative impacts which are likely results because of past, present and future impacts from NTS [Nevada Test Site] activities. For instance, the DOE mentions a proposed federal action to return certain lands of the Timbisha Shoshone. An important factor left out regarding this return is that the land was subjected to years of radioactive fallout from the Nevada Test Site. The amount of radiation exposure experienced by the indigenous people residing in the area has not been assessed nor have any baseline health studies been conducted. The people still living in the area may have experienced significantly higher levels of exposure because of the many exposure pathways common to Native American peoples. The added impacts of long-term releases from the transportation of radioactive waste and spent nuclear fuel cannot be accurately calculated. The status of the Indian nation populations should give rise to a higher degree to assurance that they will be protected from increased exposures.

The absence of previous exposure data also is important regarding impacts of long-term releases from the transportation of radioactive waste and spent nuclear fuel. A true picture of potential impacts from transportation exposure cannot be accurately calculated unless information from past Nevada Test Site releases can be added to the project exposure data.

A joint NCI/CDC [National Cancer Institute/Centers for Disease Control] effort to assess human health impacts from bomb testing at the NTS is currently underway. The people whose homelands are near the Nevada Test Site were subjected to multiple detonations of atomic weapons. This project affirms what Native American people in the area have known for years--that radioactive fallout caused significant negative health impacts which includes chromosomal damage, debilitating diseases, and mortality.

Utmost protective considerations must be accorded to the people indigenous to this area. An apparent conclusion or response to the Timbisha land return issue may be that the reservation is being created well after the Yucca Mountain has begun, thereby absolving the DOE of its trust responsibility. Once again, the Timbisha Shoshone have lived there thousands of years prior to any encroachment or intrusion of federal actions.

The fact of primary habitation of indigenous peoples, whom the federal trust responsibility is to protect, is an important point in regard to the divergence of opinion of ground-water protection requirements. The Native American tribes and citizens are entitled to assess the viability of the water protection issues. The DOE

acknowledges that further studies of impacts are needed along transportation corridors. The tribes do not have emergency response programs in place and are isolated from federal, or other assistance in an emergency situation. At the pace and funding level proposed by current DOE officials charged with delivery of emergency preparedness program planning for corridor states and tribes, when the shipments commence, even several years from now, it does not appear that tribes will be ready. Tribal governments will continue to have unmet needs and unfunded mandates.

Response
The commenter is correct that the assessment of impacts of past nuclear weapons testing at the Nevada Test Site is part of an ongoing effort by several organizations, including the National Cancer Institute and the Centers for Disease Control. However, the available information does not indicate that these assessments have concluded "that radioactive fallout caused significant negative health impacts which includes chromosomal damage, debilitating diseases, and mortality." Readers interested in further information about the effects of past testing of nuclear weapons should refer to the *National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans From Nevada Atmospheric Nuclear Bomb Tests* (DIRS 152469-Institute of Medicine and National Research Council 1999).

DOE has reviewed the available information and has included a discussion in Chapter 3 of the Final EIS on the health impacts of past above-ground weapons testing at the Nevada Test Site. In addition, Chapter 8 considers these impacts as they contribute to cumulative impacts.

Since DOE issued the Draft EIS, Congress enacted legislation, signed by the President, that created the Timbisha Shoshone Trust Lands. These lands consist of discontinuous parcels in southeastern California and southwestern Nevada. The Bonnie Claire Alternate variation of the Carlin and Caliente Corridors crosses a parcel of the trust lands near Scottys Junction, Nevada. In addition, potential shipments using the Caliente route for heavy-haul trucks would cross the same parcel on U.S. 95. DOE believes that radiation exposure impacts to persons on the Timbisha Shoshone Trust Lands from the repository, spent nuclear fuel and high-level radioactive waste transportation, and other past, present, and reasonably foreseeable activities, including past weapons testing, would be small due to the initial indications that minimal exposures would be associated with the parcels that comprise the reservation, including the parcel near Scottys Junction.

The commenter also correctly states that DOE would conduct further studies of impacts along a rail corridor or route for heavy-haul trucks should one of the implementing alternatives described in the EIS be selected for use in transporting spent nuclear fuel and high-level radioactive waste to Yucca Mountain (see Section 6.3.3 of the EIS). The studies would be conducted and reported in accordance with the applicable requirements of the National Environmental Policy Act.

As stated in Appendix M of the EIS, approximately 4 years prior to the first shipment through state or tribal reservation boundaries, DOE plans to implement Section 180(c) of the NWPA through a grants program. It is DOE's objective to provide funding and technical assistance, subject to annual appropriations, to assist states and tribes to obtain access to the increment of training necessary to prepare for NWPA shipments (63 *FR* 23753, April 30, 1998).

10 (5186)
Comment - EIS001443 / 0011
The DEIS treats both geohydrologic and transportation impacts of the proposed repository as "stand alone" issues without recognition of the fact that the repository would operate in an environment already heavily impacted by past and ongoing nuclear waste activities. Territory adjacent to the Yucca Mountain site is heavily contaminated by radioactive materials as a result of decades of Atomic Energy Commission (AEC)/Department of Energy nuclear testing, while many of the roadways and rail corridors expected to be used for transport of spent nuclear fuel and high-level nuclear waste are already in service for the transport of low level and defense wastes to the Nevada Test Site and the Waste Isolation Pilot Plant in New Mexico. Operation of the Yucca Mountain repository would be one in a series of similar, linked actions undertaken by a single agency: the Department of Energy. The additional risks which Yucca Mountain would place on groundwater resources, human populations and national and regional transportation resources must be analyzed and weighted within the context of past, present and foreseeable non-Yucca Mountain-related AEC/DOE actions in order to meet the intent of NEPA [National Environmental Policy

Act] and allow decisionmakers and the public to place the proposed action in the proper context. The NEPA exemptions provided DOE by the Nuclear Waste Policy Act do not include exemption from addressing cumulative impacts.

Response
DOE believes that Chapter 8 of the EIS contains a credible discussion of the impacts from the repository that could be cumulative with the impacts of past, present, and reasonably foreseeable activities in the region. This chapter includes discussions of short- and long-term cumulative impacts of the repository, the cumulative impacts of transportation, and the cumulative impacts of manufacturing disposal containers and shipping casks. Section 8.3 discusses the impacts of past nuclear weapons testing at the Nevada Test Site and the cumulative effects of this action and of the proposed repository. Section 8.4 discusses the cumulative effects of the transportation of radioactive material in the area, including waste transport to the Test Site and the Waste Isolation Pilot Plant.

10 (5187)
Comment - EIS001443 / 0012
The DEIS should be amended to include description of the environmental context within which repository operations and transportation of nuclear waste will take place. Specifically, the DEIS needs to map and quantify the current level of environmental contamination in the region, and current and projected non-Yucca Mountain nuclear and hazardous waste shipment activity. This information needs to be compiled in a manner such that the incremental increase in risk posed by the repository and the total risk to humans and natural resources posed by the sum of DOE activities is clearly discernable.

Response
DOE believes that Chapter 8 of the EIS contains a credible discussion of the impacts from the repository that could be cumulative with the impacts of past, present, and reasonably foreseeable activities in the region. This chapter includes discussions of short- and long-term cumulative impacts of the repository, the cumulative impacts of transportation, and the cumulative impacts of manufacturing disposal containers and shipping casks. Section 8.4 of the EIS contains an analysis of the cumulative transportation impacts that could occur as the result of past, present, and reasonably foreseeable actions. While the total impacts from these separate actions is not necessarily the sum of the impacts of the individual actions, the list of impacts in Table 8-58 provides a sense of the scale of the potential impacts.

10 (5261)
Comment - EIS001887 / 0020
The Draft EIS fails to adequately assess cumulative impacts from past, current, and future activities at the Nevada Test Site (NTS). Estimates of the NTS contribution to off-site radiation exposures and projections of future cumulative exposures are based on woefully inadequate and incomplete data. Known and suspected contaminated sites in the proposed withdrawal area are not acknowledged, and their remediation status is not described.

DOE's own estimates place the combined source term for all tests conducted at the NTS at 300 million curies. The geographic scope of existing groundwater contamination in the region may exceed 300 square miles and extend to depths ranging from 500 to 5,000 feet. Yet the Draft EIS concludes that the maximum potential dose from the underground testing inventory is calculated to be 0.2 millirem per year and that the cumulative annual dose from both NTS and Yucca Mountain sources would [be] 0.42 millirem per year.

In fact, DOE does not have the data required to calculate a base case scenario for determining groundwater travel time in the region, let alone to make an estimate of radionuclide movement in the groundwater. Estimates of hydraulic conductivity contained in the Draft EIS (e.g., movement of contaminants through the groundwater) rely on only one data set obtained from a single well for a period of fifty years. This limited data is then extrapolated over a 10,000 year period to produce the estimated 0.2 millirem per year dose figure (as the contribution to cumulative groundwater impacts caused by nuclear testing). As a result, it is not possible, with any reasonable level of confidence, to estimate the amount of radionuclides released through the groundwater to the biosphere in the region of influence beneath the NTS and offsite locations. Both the State of Nevada and DOE's own independent peer review group (2) have documented these facts as part of ongoing technical and regulatory reviews of DOE's Underground Test Area program for the NTS.

Developing believable and reasonable estimates of the potential cumulative impacts to groundwater from existing contamination beneath the NTS and future contamination from a proposed repository at Yucca Mountain is mandatory for assessing the degree to which the Proposed Action would affect public health and safety. The Draft EIS fails to make this fundamental assessment and is, therefore, deficient. The Draft EIS fails to meet the basic requirement of NEPA [National Environmental Policy Act] as defined by the Council of Environmental Quality implementing regulations, Sec. 1500.1(b).

The Draft EIS also fails to adequately assess impacts from contaminated sites known to be located within the proposed repository withdrawal area. For example, it is known that there are high-level waste residues from the nuclear rocket program buried at an unknown location in Area 25 of NTS. The Draft EIS must contain affirmative information regarding the location of this material and assure that, if it is in the proposed withdrawal area, it will be recovered and managed according to applicable laws, regulations, and orders. In addition, there are reportedly at least 20 other known contaminated sites within the portion of the NTS that is included in the proposed withdrawal area. These areas must be fully rehabilitated under the jurisdiction of NTS so they are not passed on to OCRWM [Office of Civilian Radioactive Waste Management], where they would remain a continuing hazard. The impacts associated with required clean-up activities should have been addressed in the Draft EIS.

(2)"External Peer Review Group Report on Frenchman Flat Data Analysis and Modeling Task, Underground Test Area Project," (ITLV/13052-077A0), prepared for U.S. Department of Energy, Nevada Operations Office under contract No. DE-ACO8-97NV13052 (September 1999).

Response
Section 8.3.2.1.1 of the EIS acknowledges that there is uncertainty in estimating potential impacts to groundwater from past weapons testing on the Nevada Test Site. Some groundwater parameters are not known with certainty, and other information cannot be disseminated to the public due to national security concerns. The Draft EIS analyzed the cumulative impacts to groundwater from the repository, as well as from past underground weapons testing and low-level radioactive waste disposal at the Nevada Test Site. The Final EIS contains additional, more detailed analyses based on more recent data.

DOE believes that the values and assumptions used in the updated analyses in the Final EIS ensures the Department considered the associated range of cumulative impacts. DOE chose these values based on analyses in the Nevada Test Site EIS (DIRS 101811-DOE 1996) and believes it has made a reasonable estimate of the impacts. As stated in the EIS, DOE believes that its assumptions resulted in a conservative estimate of the true impacts. It is true that the Department used data for hydraulic properties based on measurements from a single well, as stated in Section 8.3.2.1.1. This point is one of the sources of uncertainty in the analysis; DOE used the best available data and the professional judgment of its analysts to arrive at an estimate of the impacts.

DOE has not determined future responsibilities for the management of Area 25. There are no known sites in Area 25 where spent nuclear fuel has been buried. Parts from the old nuclear rocket program, and perhaps some fuel from that program, might be buried somewhere in Area 25, but nothing definite is known about the nature of the material or where it might be buried. This material was not accounted for in the cumulative impacts analysis because its existence, location, amount, and characteristics are not known.

10 (5282)
Comment - EIS000817 / 0160
P. 8-1. So now you want to dump everything you can in the repository if you open it -- surely not what Nevada was told at the beginning of this speculation! So if the NRC [Nuclear Regulatory Commission] says put it in the repository -- Congress will agree -- and in all these other types of waste go -- further complicating materials interaction analysis -- and the "radioactive soup" at the end of repository life becomes more "spicy" than before. (And Nevada gets the Nevada Test Site waste and Beatty Waste Disposal area, too.) Poor Nevada.

Response
Comments that DOE received from the public during the scoping process for this EIS expressed the concern that more spent nuclear fuel and high-level radioactive waste would be generated than the 70,000 metric tons of heavy metal accounted for in the Proposed Action. In response to those comments, DOE evaluated the emplacement of the total projected inventory of commercial spent nuclear fuel and DOE spent nuclear fuel and high-level radioactive

waste (Inventory Module 1) and of that total inventory plus the inventories of commercial Greater Than-Class-C low-level waste and DOE Special-Performance-Assessment-Required waste (Inventory Module 2). Sections 8.2 and 8.3 of the EIS examine the cumulative short- and long-term impacts of the Proposed Action along with the disposal of Inventory Modules 1 and 2. The analysis of future activities in Chapter 8 is not restricted to activities that would occur with certainty; rather, the analysis gives an estimate of potential cumulative impacts from actions that are reasonably foreseeable.

Disposal of more than 70,000 metric tons of heavy metal at the repository would require legislative action by Congress unless a second licensed repository was in operation. Disposal of Greater-Than-Class-C low-level waste and Special-Performance-Assessment-Required waste at the repository would require either legislative action or a determination by the Nuclear Regulatory Commission that the material should be classified as high-level radioactive waste.

10 (5549)
Comment - EIS001887 / 0188
Page 3-79; Section 3.1.8 - Occupational and Public Health and Safety

It is known that there is some high-level waste residue from the nuclear rocket program buried at an unknown location in Area 25 of NTS [Nevada Test Site]. The Draft EIS must contain affirmative information regarding its location and assure that, if it is in the proposed withdrawal area, it will be recovered and managed according to applicable laws, regulations, and orders. Also, there are reportedly some 20 contaminated sites within the portion of Area 25 of the NTS that is included in the proposed withdrawal area. Before issuance of a Final EIS, these areas must be fully rehabilitated under the jurisdiction of NTS so they are not passed on to OCRWM [Office of Civilian Radioactive Waste Management] where they would remain a continuing hazard.

Response
DOE has not determined future responsibilities for the management of Area 25. There are no known sites in Area 25 where spent nuclear fuel has been buried. Parts from the old nuclear rocket program, and perhaps some fuel from this program, might be buried somewhere in Area 25, but nothing definite is known about the nature of the material or where it might be buried. This material was not accounted for in the cumulative impacts analysis because its existence, location, amount, and characteristics are not known.

10 (5550)
Comment - EIS001660 / 0045
Mineral County submits Eureka County's analysis as Mineral County's comments (see Attachment E). [Following is text from reference.]

Analysis of shared rail use inadequate. The analysis of the impacts of shared public/private use of DOE branch rail lines is inadequate. (pp. 8-4, -15) The analysis properly belongs in Chapter 6, Transportation Impacts. The statement that predicting increases in rail traffic from shared use would be difficult and, therefore, is not done is unacceptable. The DEIS says there will be impacts, and they must be analyzed, disclosed, and mitigated as necessary. (p. 8-87)

Analysis of impacts on public services inadequate. The DEIS does not adequately address cumulative impacts on emergency response services. The DEIS says that cumulative operations impacts would result because of the extra 14 years of shipping required for Modules 1 or 2 (p. 8-85) but that the DOE expects no cumulative socioeconomic impacts. This conclusion is contradictory and improbable since state, local, and tribal government emergency services would continue to be impacted.

Other comments. The failure of Congress to ratify the Nuclear Test Ban Treaty makes the future resumption of nuclear weapons tests more likely. (pp. 8-3,-11, -12) The statement that interim storage was not analyzed for cumulative impacts because it is uncertain is inappropriate; it is reasonably foreseeable and must be included. (p. 8-5) The inadequacies of the air pollution analysis are similar to those in Chapter 4: the discussion is vague and the conclusions unsupported by the evidence, particularly the statement that there will be no effect on the Las Vegas Valley air basin. (pp. 8-24 to 8-30) The statement that the final EIS will review new information from the Pipeline

Southeast Expansion Project for cumulative impacts is unacceptable, since the public will not have the opportunity to comment (p. 8-85).

Response

DOE structured the cumulative impact assessments presented in Chapter 8 of the EIS by identifying actions the effects of which could coincide in time and space with the effects from the proposed repository and associated transportation activities. Consistent with Council on Environmental Quality regulations (40 CFR 1508.7), DOE considered past, present, and reasonably foreseeable actions in its assessment of cumulative impacts and has reviewed a number of actions, current and proposed, to determine relevance. The expression "reasonably foreseeable" refers to future actions for which there is reasonable expectation that the action could occur, such as a proposed action under analysis, a project that has already started, or a future action that has obligated funding.

The identification of the relevant actions was based on reviews of resource, policy, development, and land use plans prepared by agencies at all levels of government and from private organizations, other environmental impact statements, environmental assessments, and tribal meeting records. Consistent with Council on Environmental Quality regulations [40 CFR 1502.16(c) and 1506.2], in addition to the assessment of potential environmental impacts, the potential conflicts with plans issued by various entities were considered to the extent they provided relevant information. Once DOE selected a transportation mode and specific transportation corridor, more definitive information could be developed on potential conflicts with land uses and various agency plans and policies and, ultimately, the mitigation measure that could be needed to resolve conflicts and impacts on a given area.

In the case of shared rail use, DOE believes that the rail lines discussed in Chapter 8 of the EIS would have benefits for the surrounding communities and industries. However, potential sharing of the rail line is speculative at this point, and including these rail lines in the cumulative impact analyses could result in a misrepresentation of those impacts.

In relation to public services, the continuation of operations for an additional 14 years would not result in an increase or decrease in emergency response services. Because the status quo would be maintained, DOE does not expect socioeconomic impacts.

Since 1992, there has been a moratorium on nuclear testing. Even though the Nevada Test Site must maintain the ability to resume testing, the Department does not believe that a resumption of testing is a reasonably foreseeable action. Therefore, it was not included in the analyses in Chapter 8 of the EIS. Nevertheless, a recent evaluation of impacts from a resumption of underground testing at the Nevada Test Site (DIRS 103273-Walck 1996) concluded that the only impact such testing would pose on the repository would be ground motion from the energy released by the detonations. DOE has determined that such effects would not exceed the seismic design criteria for the repository. In other words, the design-basis earthquake for the repository would generate stronger ground motions than would underground nuclear detonations on the Nevada Test Site. Because DOE has designed the repository to survive the design-basis earthquake with minimal damage, ground motion from the resumption of underground testing would be unlikely to result in substantial damage to the surface or underground facilities at Yucca Mountain.

DOE believes that interim storage at Yucca Mountain is not a reasonably foreseeable action, and that it is inappropriate to analyze potential impacts of that action in the EIS. As stated in Section 2.2 of the EIS, if Yucca Mountain was determined to be unsuitable or not approved by the President or Congress, DOE would prepare a report to Congress. This report, required by the NWPA, would contain DOE recommendations for further action to ensure the safe, permanent disposal of spent nuclear fuel and high-level radioactive waste, including the need for new legislative authority. Other than this action, the future course that Congress, DOE, and the commercial nuclear power utilities would take is uncertain. Several possibilities would be pursued, including centralized interim storage, for example, the Private Fuel Storage Facility proposed in northern Utah (see Section 8.1.2.3 of the EIS), or the study of another location for a deep geologic repository.

Section 8.3.2.1 describes the activities on the Nevada Test Site that could be cumulative with impacts from the proposed repository. Since issuing the Draft EIS, DOE has revised some of the analyses of impacts associated with the Test Site. For example, Sections 8.2.2.2 and 8.2.7 of the EIS now include information on radiation exposure from past nuclear weapons testing, and Section 8.3 includes updated estimates of future impacts to groundwater and air resources from activities on the Nevada Test Site.

10 (5556)
Comment - EIS001887 / 0189
Page 3-83; Section 3.1.8.2 - Radiation Environment in the Yucca Mountain Region

This section references Bechtel 1998, page 7-5, the Annual Site Environmental Report for the Nevada Test Site. All of the off-site radiological doses in this report are given as EDE, effective dose equivalents. EPA's [the Environmental Protection Agency's] Clean Air Package 1988 (CAP-88 PC) program was used to calculate the doses. The dose being calculated is actually the committed effective dose equivalent (CEDE) and should not be given as an EDE.

Response
The commenter is correct in noting that the Clean Air Package 1988 software calculates the committed effective dose equivalent. In addition, Clean Air Package 1988 calculates doses from external exposure. However, the committed effective dose equivalent is merely a designation for effective dose equivalent calculated for internal exposures. The term "committed" refers to the fact that following intake (regardless of the length of intake), the individual is committed to receive a given dose until the radioactive material is effectively removed from the tissues of the body. Therefore, the committed effective dose equivalent that results from intakes during a year (that is, an annual intake) can be compared and added to the effective dose equivalent that results from external radiation exposure. When the International Commission on Radiological Protection introduced the concept of effective dose equivalent (DIRS 101075-ICRP 1977), the concept included both internal and external exposures.

10 (5740)
Comment - EIS001887 / 0344
Page 8-12; Section 8.1.2.2 - Federal Actions - DOE Waste Management Activities

The statement in paragraph 2 of this section regarding potential short- and long-term cumulative impacts of waste management activities is not consistent with information in Table 8-1 (page 8-4) that indicates no short-term cumulative impacts from future potential waste management activities.

Response
DOE has revised Table 8-1 to indicate that there are no short-term impacts beyond those evaluated for Nevada Test Site activities.

10 (5741)
Comment - EIS001887 / 0345
Page 8-22; Table 8-5 - Summary of cumulative short-term impacts in the proposed Yucca Mountain Repository region.

Utilities: Table 8-5 states that peak electric power demand would require an upgrade of the transmission and distribution system. In order for this EIS to be complete, it should include an evaluation of impacts of a specific proposed upgrade since it is acknowledged that an upgrade would be required as part of the Proposed Action. Section 8.2.11 does not provide an evaluation of the impacts of the necessary upgrade.

Response
To the extent reasonable, DOE analyzed the impacts of upgrading the electrical transmission system in Section 4.1.11.2 of the EIS. Because this analysis identified no adverse impacts to the environment, the Department did not repeat the discussion in Chapter 8. To avoid confusion on this issue, the Department has added text to Chapter 8 that refers to the discussion in Chapter 4.

10 (5743)
Comment - EIS001887 / 0347
Page 8-31; Section 8.2.2.2.2 - Radiological Air Quality

This section incorrectly states that the 2.5 mrem per year cumulative dose is "about 40 percent" of the 10 mrem annual dose regulatory limit.

Response
The Department has updated Section 8.2.2.2.2 of the EIS to reflect the proper percentage for the cumulative dose in relation to the annual dose limits.

10 (5744)
Comment - EIS001887 / 0348
Page 8-36; Section 8.2.4 - Biological Resources

This section is deficient in two major respects. First, an ecosystem approach was not adopted for the Draft EIS and second, thermal loading impacts are not factored into cumulative effects. Therefore, this section is inadequate.

Response
The commenter's contention that DOE should have used an ecosystem approach in analyzing the Proposed Action is described as an opposing view in Section 3.1.5. That section also contains DOE's reasons for selecting the analytic approach used in the EIS. The Department believes that the approach used in the EIS is adequate.

10 (5745)
Comment - EIS001887 / 0349
Page 8-37; Section 8.2.5 - Cultural Resources

DOE should make provisions for identifying, evaluating, and treating historic properties if Inventory Module 1 or 2 is authorized.

Response
The Department realizes that the implementation of Inventory Modules 1 or 2 would disturb more land than was analyzed for the Proposed Action. As discussed in Section 8.2.5, if either inventory module is implemented, the Department would fulfill its obligations under Section 106 of the National Historic Preservation Act, as amended to ensure that cultural resources (including historic properties) were preserved to the extent possible.

10 (5746)
Comment - EIS001887 / 0350
Page 8-59; Section 8.3 - Cumulative Long-Term Impacts in the Proposed Yucca Mountain Repository Vicinity

The performance assessment results shown in tables for this section are based on a Total System Performance Assessment (TSPA) code and supporting analyses developed prior to those that will be used in the site suitability evaluation for site recommendation. The Draft EIS must include a description of the current TSPA and include its results and analyses rather than relying on an acknowledged incomplete and obsolete TSPA. In order to meet the need for a complete and accurate evaluation of the long-term impacts of the Proposed Action, DOE should issue a new Draft EIS for public review and comment that includes information and analyses consistent with the Site Recommendation Report.

Response
Section 8.3 of the Final EIS contains the results of the most current Total System Performance Assessment for the flexible design.

10 (5747)
Comment - EIS001887 / 0351
Page 8-74; Section 8.3.2.1 - Past, Present, and Reasonably Foreseeable Future Actions at the Nevada Test Site - Item Number 5. Shallow Land Radioactive Waste Disposal

There has been no demonstration of the "absence of a groundwater pathway." Section 8.3.2.1.3 does not provide any basis for this assertion.

Response
The commenter is correct. DOE has changed the EIS accordingly.

10 (5748)
Comment - EIS001887 / 0352
Pages 8-74 to 8-76; Section 8.3.2.1.1 - Underground Nuclear Testing

The discussion in this section of the Draft EIS addresses cumulative impacts associated with groundwater contamination within the Yucca Mountain region. The discussion covers contamination beneath the Nevada Test Site (NTS).

Between 1951 and 1992, DOE conducted more than 1,000 nuclear tests at the NTS. Nearly one third of these tests were conducted in or near the groundwater. State officials contend that as much as 300 square miles of surface and subsurface area on and off the NTS are contaminated with radionuclides. The Draft EIS states that the estimated radionuclides source term for all subsurface tests was 300 million curies.

This section of the Draft EIS concludes by stating that "...the maximum potential dose from the underground testing inventory is calculated to be 0.2 millirem per year...." The document further states that the maximum cumulative impact of the Proposed Action in 10,000 years (i.e., radionuclides released from Yucca Mountain at the proposed point of compliance (20 kilometers from the repository) would be 0.22 millirem per year. Adding this to the NTS release of 0.2 millirem per year produces a cumulative release of 0.42 millirem per year.

The State of Nevada believes it is not yet possible, with any reasonable level of confidence, to estimate the release of radionuclides through the groundwater to the biosphere in the region of influence beneath the NTS and offsite locations. In fact, DOE does not have the data required to calculate a base case scenario for determining groundwater travel time in the region, let alone to make an estimate of hydraulic conductivity (important for determining the rate of movement of contaminants in the groundwater). The State of Nevada has repeatedly documented these facts as part of the State's ongoing regulatory review of DOE's Underground Test Area program for the NTS. The State's detailed comments are available on the World Wide Web at the following addresses:

http://www.state.nv.us./ndep/boff/ndep13.htm
http://www.state.nv.us./ndep/boff/ndep11.htm

It should also be noted that DOE's current program for assessing groundwater contamination beneath the NTS was recently criticized by an independent external peer review group commissioned by DOE. Overall, the reviewers found inadequate data to support groundwater flow modeling at NTS. They noted that available groundwater level and permeability data were inadequate for the assessment of groundwater flow directions, rates, and travel times in the vicinity of the contaminated areas.(35)

Despite assumptions presented in the Draft EIS, any attempt by DOE to present a "bounding-analysis" of potential cumulative groundwater contamination caused by nuclear testing at the NTS is simply not possible. Moreover, estimates of hydraulic conductivity contained in the Draft EIS rely on only one data set obtained from only one well in a period of fifty years. Using this limited information and then extrapolating the data over a 10,000-year period to produce the estimated 0.2 millirem per year dose figure is pure fiction.

Current estimates suggest the geographic scope of existing groundwater contamination in the region may exceed 300 square miles and extend to depths ranging from 500 to 5,000 feet.

Developing believable and reasonable estimates of the potential cumulative impacts to groundwater from existing contamination beneath the NTS and future contamination that would escape from a proposed repository at Yucca Mountain is mandatory for assessing the degree to which the Proposed Action would affect public health and safety. The Draft EIS fails to make this basic, rudimentary assessment and is, therefore, deficient. The Draft EIS fails to meet the basic requirement of NEPA [National Environmental Policy Act] as defined by the Council of Environmental Quality implementing regulations, Sec. 1500.1(b).

Groundwater contamination attributable to underground nuclear weapons testing has been found off the NTS on the Nellis Air Force Range. Also, contamination has been detected within the NTS boundaries as far as 0.8 miles from a nuclear test location known to be the source of the contamination.

(35) "External Peer Review Group Report on Frenchman Flat Data Analysis and Modeling Task, Underground Test Area Project," (ITLV/13052-077A0), prepared for U.S. Department of Energy, Nevada Operations Office under contract No DE-ACO8-97NV13052 (September, 1999).

Response
Section 8.3.2.1.1 of the EIS acknowledges that there is uncertainty in estimating potential impacts to groundwater from past weapons testing on the Nevada Test Site. For the Final EIS, the Department has refined the Nevada Test Site groundwater impact analysis to consider not only the total inventories of radionuclides, but also the relative source term radionuclide concentrations and dilution factors for the repository and the Nevada Test Site. However, some groundwater parameters are not known with certainty, and other information cannot be disseminated to the public. The Draft EIS analyzed the cumulative impacts to groundwater from the repository, as well as from past underground weapons testing and low-level radioactive waste disposal at the Nevada Test Site. The Final EIS contains additional, more detailed analyses based on more recent data.

DOE believes that the values and assumptions used in the updated analyses in the Final EIS provide a conservative estimate of cumulative impacts. DOE chose these values based on analyses in the Nevada Test Site EIS (DIRS 101811-DOE 1996) and believes it has made a reasonable estimate of the impacts. As stated in the EIS, DOE believes that its assumptions resulted in a conservative estimate of the impacts. It is true that the Department used data for hydraulic properties based on measurements from a single well, as stated in Section 8.3.2.1.1. This point is one of the sources of uncertainty in the analysis; DOE used the best available data and the professional judgment of its analysts to arrive at an estimate of the impacts.

10 (5749)
Comment - EIS001887 / 0353
Page 8-77; Section 8.3.2.1.3 - Future Nevada Test Site Low-Level Waste Disposal

Paragraph 3 under this section of the Draft EIS states that "DOE proposes to locate the Mixed Waste Disposal unit, which will be a landfill, on about 0.18 [square] kilometers (45 acres) of the Area 5 site, immediately north of the developed Radioactive Waste Management Site landfill area. The design has been completed, the unit has been included in the Resource Conservation and Recovery Act [RCRA] permit application, and the environmental assessment is being updated."

Virtually all of the information stated above is outdated and incorrect. DOE's permit application related to the Area 5 site is at least five years out of date. DOE's current RCRA permit re-application was submitted to the State in October 1999. This re-submittal only requests authorization to use an existing mixed waste trench (pit 3) for disposal of defense low-level mixed waste generated on NTS [the Nevada Test Site].

Response
The Department acknowledges that the information in Section 8.3.2.1.3 of the Draft EIS contained errors. At this time, DOE is only seeking a permit for Area 5 interim status, pit 3, mixed-waste disposal unit. DOE resubmitted its permit application on November 2, 1999.

In the future, if the mixed waste volume warrants it, the Department may consider obtaining a new unit and hence a new permitted facility. However, the current projected waste volumes do not indicate that an additional mixed waste disposal unit is necessary.

Section 8.3.2.1.3 of the Final EIS reflects this updated information.

10 (5750)
Comment - EIS001887 / 0354
Page 8-89; Section 8.4.2.4 - Biological Resources and Soils

The section concerning Nevada transportation impacts appears to address only the intermodal transfer stations and not the routes to be followed through the state. For these reasons, the section is inadequate. Guidance such as that provided by Clark and Cantor (1997) should have been followed to supplement CEQ's 1997, "Considering Cumulative Effects Under the NEPA."

Response
Cumulative impacts from transporting waste through Nevada are described in Section 8.4.2. As indicated, the Carlin Corridor could have cumulative impacts with gold-mining activities in Crescent Valley that could require mitigation (see Section 8.1.2.3 for more information about these activities). Direct and indirect impacts from constructing and operating a branch rail line, and upgrading highways, are described in Section 6.3.

In general, the analysis of cumulative impacts in Chapter 8 followed the process recommended in the Council on Environmental Quality's handbook *Considering Cumulative Effects Under the National Environmental Policy Act* (DIRS 103162-CEQ 1997). This process included the identification, through research and consultations, of Federal, non-Federal, and private actions with possible effects that would be coincident with those of the Proposed Action on resources, ecosystems, and human communities.

10 (5964)
Comment - EIS001879 / 0054
With respect to cumulative impacts, the Yucca Mountain EIS finds that the potential impacts to groundwater would be small, limited to the immediate vicinity of the land disturbances associated with the repository, and that some minor incremental risk would occur from drinking the groundwater down gradient of the repository at some distant time in the future. These conclusions are inconsistent with statements in the Draft EIS.

Response
DOE recognizes that some radionuclides or potentially toxic chemicals would eventually enter the environment outside the repository. The regional flow model prepared by the U.S. Geological Survey (DIRS 100131-D'Agnese et al. 1997) suggests that some of the water from the Nevada Test Site flows to the south toward the Amargosa Valley in the vicinity of Yucca Mountain. However, the actual transport times and groundwater pathways from radionuclide contaminants on the Nevada Test Site are not clear at this time. Section 8.3.2.1.1 contains a qualitative calculation of the cumulative radiological impact from the Test Site and Yucca Mountain that indicates that the potential cumulative peak dose would be well below the regulatory limits established by the Environmental Protection Agency in 40 CFR Part 197. This combined peak dose would occur only if the peak concentrations from the Test Site and Yucca Mountain occurred at the same time and same location, which would be unlikely.

10 (5968)
Comment - EIS001879 / 0052
Let me briefly summarize the results of Nye County's water resource studies for the record. Our evaluations found that the direct impacts of water withdrawals for the proposed repository will be limited to a localized lowering of water levels that was not deemed to be significant. However, the evaluation did find that the predicted leakage from the repository and the cumulative impacts of the proposed repository will indeed be significant and that mitigating measures must be implemented. The Draft Yucca Mountain EIS is inadequate with regard to its evaluation of impacts on water resources and corresponding mitigation and, must be revised extensively.

The cumulative impacts on water resources will include the direct and indirect impacts of: 1) the total radiological burden that will be imposed on Nye County; 2) the impacts of federal land withdrawals on water resource availability; 3) the impacts of federal policies regarding nuclear weapons testing, waste disposal, and environmental protection; and 4) the water resource use and management practices on both private and federal lands in the County.

Response
DOE is relying on both the inherent natural geologic features of Yucca Mountain and the engineered barriers to isolate the spent nuclear fuel and high-level radioactive waste from the human environment (see Section 2.1 of the EIS). The waste packages to be emplaced in the repository are an important component of the engineered barrier system, as are other features that would be engineered into the repository. Some of these engineered features are proposed solely as mitigation measures to improve the long-term performance of the repository and decrease long-term impacts to the region's water resources. Chapter 9 of the EIS discusses these mitigation measures.

In relation to the cumulative impacts on water resources, Section 8.2.3 describes the cumulative short-term impacts to water resources, and Section 8.3 describes the cumulative long-term impacts to water resources. DOE believes that these sections contain a credible discussion of the cumulative impacts to water resources from the repository and from past, present, and reasonably foreseeable activities in the Death Valley flow system. The Final EIS

contains additional information on water use by Federal activities within this region of influence. DOE's position, as stated in the EIS, is that cumulative water withdrawals would affect the region's water resources, but that land withdrawals would not be directly linked. Water users in Nye County who are potentially affected by the Proposed Action are hydraulically downgradient from Air Force and DOE users on the Nevada Test Site and Yucca Mountain. As described in Section 8.2.3.2, DOE recognizes that water use for the repository would decrease, to a limited extent and in the short term, water that would be available to downgradient users. The land that would be withdrawn for the repository would not alter the quantity of water available to downgradient users. That is, the land withdrawal itself would not affect water resources.

In relation to Federal policies, the EIS addresses the impacts that have resulted or could result from these policies in the affected area, but not the impacts of the policies themselves. In addition, the impacts that have resulted from water management practices in the affected area are described in the EIS, but not the impacts of the practices themselves. Water management practices that affect parts of Nye County but that are outside of the proposed repository's region of influence for water resources are not within the scope of the EIS.

10 (5972)
Comment - EIS001879 / 0050
In total, the United States has implemented a policy of permissible pollution upgradient of the communities of Amargosa Valley and Pahrump and absolute preservation of the groundwater quality and quantity in the areas downgradient of these communities. Nye County, in their water resource planning efforts is between the proverbial rock and a hard place. Yucca Mountain will perpetuate the policy of permissible pollution and will further reduce the quantity of water that is available to meet future water demands in the County.

Under 40 CFR 1508.18(b)(3) NEPA [National Environmental Policy Act] mandates that the impacts of federal policies must be evaluated in an EIS. The Yucca Mountain EIS must be revised to address the impacts of these contrasting federal water resource policies. The YMP [Yucca Mountain] DEIS does not evaluate the cumulative impacts of implementing these federal policies and actions, on a regional backdrop of rapid growth.

In short, Nye County has faithfully served as the nation's sandbox for almost half a century. Unfortunately, the Department of Energy and the Air Force have contaminated their portions of the sandbox and the Department of Interior demands that their portions be left pristine. These policies have had far reaching consequences for the County and greatly hamper water-planning efforts.

Response
The Nuclear Waste Policy Act of 1982 makes it the policy of the United States to dispose of the Nation's spent nuclear fuel and high-level radioactive waste permanently in a geologic repository. The performance of a repository at Yucca Mountain, if built, would have to be in compliance with groundwater protection standards established specifically for the repository by the Environmental Protection Agency (40 CFR Part 197). If the repository could not meet these standards, the site would be disqualified.

Section 8.2.3.2.2 of the Final EIS includes a more detailed discussion of water withdrawal issues, including current and projected water use for current and reasonably foreseeable activities in the region of influence.

10 (5974)
Comment - EIS001879 / 0049
The proposed repository is predicted to leak additional radioactive contamination into the aquifers in the southwestern portion of the Nevada Test Site...water that is currently potable will be contaminated if the DOE's Performance Assessment is correct. This will result in a significant adverse impact on the water resources that must be mitigated.

Response
The Environmental Protection Agency (EPA) has developed groundwater protection standards and individual protection standards for the proposed Yucca Mountain Repository (40 CFR Part 197). EPA developed the standards for a 10,000-year compliance period to protect human health and the environment, including groundwater. The impacts reported in this EIS for the first 10,000 years would be at levels well below the EPA standards.

In addition, 40 CFR Part 197 provides that the EIS report peak dose values. Therefore, the EIS reports such values for the period of geologic stability (1 million years). The mean of the peak dose would be above the EPA standard applicable to the first 10,000 years, but still below the average annual background dose to residents of the United States.

Given the EIS results for the 10,000-year period and the period after that, DOE believes it is not necessary to envision any mitigating action beyond that already provided by the design of the repository system. It is unreasonable to identify other potential mitigation needs and actions for the post-10,000-year period because of the inability to foresee what standards might be protective that far in the future, or what technologies might be available and implemented, if necessary, to achieve such standards.

10 (5980)
Comment - EIS001879 / 0010
The DOE, through their selection of a reduced region of influence, limited their analysis to only the direct impacts of their water withdrawals from a single basin while ignoring documented impacts that occur over a much broader region. Further, the Department ignored other federally prepared reports that detailed the direct, indirect, and cumulative impacts of Department of Defense, Energy, and the Interior actions over the same region. This approach is inconsistent with the CEQ [Council on Environmental Quality] guidance for considering cumulative impact assessment under NEPA [National Environmental Policy Act] and with 40 CFR 1508.25. The methods used in the Draft EIS should be revised to be consistent with CEQ guidance.

The Draft EIS states, with regard to cumulative impacts, that the potential impacts to groundwater would be small and limited to the immediate vicinity of the land disturbances associated with the action and that some minor incremental risk would occur from drinking the groundwater down gradient of the repository at some distant time in the future.

The approach used is inconsistent with statements presented in the Draft EIS. Specifically:

"The general path of water that infiltrates through Yucca Mountain is south toward Lathrop Wells, into and through the area around Death Valley Junction in the lower Amargosa Valley. Natural discharge of groundwater from beneath Yucca Mountain probably occurs farther south at Franklin Lake Playa;" Vol. I, p. 5-23.

"The implementation of the proposed action could potentially affect the water supply in Death Valley National Park, which is down gradient from Yucca Mountain;" Vol. II, Appendix C, page C-9.

The region of influence evaluated for cumulative impacts cannot be smaller than the region over which impacts are expected to occur. Thus, the Department's approach is inconsistent with the letter and intent of NEPA, CEQ guidance, and other federal documents including the Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE, 1996) and the Special Nevada Report. The cumulative impacts on water resources will include the direct and indirect impacts of 1) the total radiological burden that will be imposed on Nye County; 2) the impacts of federal land withdrawals on water resource availability; 3) the impacts of federal policies regarding nuclear weapons testing, waste disposal, and environmental protection; and 4) the water resource use and management practices on both private and federal lands in the County.

If the DOE chooses to continue to ignore the local perspective by not evaluating the impacts identified in the Nye County document and by other federal agencies, then it is imperative that Nye County's perspective be clearly documented in the EIS as an opposing technical viewpoint, as discussed in Section 2.5.3 of the Draft EIS.

Response
In general, the analysis of cumulative impacts in Chapter 8 followed the process recommended in the Council on Environmental Quality's handbook *Considering Cumulative Effects Under the National Environmental Policy Act* (DIRS 103162-CEQ 1997). This process included the identification, through research and consultations, of Federal, non-Federal, and private actions with possible effects that would be coincident with those of the Proposed Action on resources, ecosystems, and human communities.

Section 4.1.3 of the EIS states that the region of influence for groundwater includes "aquifers under the areas of construction and operations that DOE could use to obtain water, and downstream aquifers that repository use or long-term releases from the repository could affect." The affected environment for groundwater therefore includes the pathway that groundwater beneath Yucca Mountain would travel, as well as the downgradient aquifers that could be affected by water withdrawals at Yucca Mountain. As indicated in Section 3.1.4.2.1, the primary discharge point for groundwater flowing beneath Yucca Mountain is believed to be Franklin Lake Playa in Alkali Flat, but DOE recognizes that some groundwater reaching this far might bypass this playa and continue on to Death Valley. In addition, the section notes that a small amount of the groundwater that flows beneath the Amargosa Desert might travel through fractures in the relatively impermeable Precambrian rocks at the southeastern end of the Funeral Mountains toward springs in the Furnace Creek Wash area of Death Valley. For the cumulative impacts analysis in Section 8.3.2 of the EIS, areas of groundwater north of Yucca Mountain on the Nevada Test Site were included because these areas could contribute to the cumulative impacts to groundwater. DOE believes that the region of influence considered for the evaluation of cumulative impacts is appropriate.

The second paragraph of the comment identifies two statements from the Draft EIS. The first is that cumulative impacts to groundwater would be small and limited to the immediate vicinity of the repository, and the second is that there would be impacts to downgradient areas at some time in the future. DOE believes that these two comments refer to discussions of short-term and long-term cumulative impacts to groundwater in Sections 8.2 and 8.3 of the EIS, respectively. Similar to Chapter 4, short-term impacts are those associated with the construction, operation and monitoring, and closure of the repository. As in Chapter 5, long-term impacts are those associated with the performance of the repository over thousands of years after closure. The statement that describes short-term impacts as being limited to the immediate area can be found almost verbatim in Section 8.2.3.2.2; however, the sentence immediately following the statement reads, "The exception to this would be the potential impact from water demands on groundwater resources." DOE acknowledges that impacts to water resources must be considered over a larger area and that they extend to the region of influence described in the preceding paragraph. The evaluation of long-term cumulative groundwater impacts (Section 8.3) is consistent with the methodology described in Chapter 5. That is, impacts associated with groundwater use and consumption are calculated for several different locations at increasing distances along the primary water pathway, as described in the commenter's quote from Chapter 5. DOE believes that the approaches used to evaluate cumulative impacts are consistent with those used in Chapters 4 and 5.

The comment's second quote [from Draft EIS Section C.2.13 (Section C.2.1.5 in the Final EIS)] deals with the potential for the Proposed Action to affect the water supply in Death Valley National Park. As described above, the Park is part of the region of influence for groundwater because it is located over "downstream aquifers that repository use or long-term releases from the repository could affect." Neither Chapter 5 nor the cumulative impacts addressed in Chapter 8 specifically address risks at the Park as a result of groundwater use and consumption. However, it can be clearly seen in the evaluations presented in both chapters that risks would decrease with increased distance from Yucca Mountain. Accordingly, impacts to the Park, because it is far away on the groundwater flow path, would be less than those for the farthest distance specifically discussed in the text.

DOE does not agree with the comment that the region of influence for groundwater, as described here and in the EIS, is smaller than the region over which impacts are expected to occur. DOE believes that the approach used for defining this region of influence is appropriate. The region of influence is consistent with that used for the cumulative impact analysis presented in the Nevada Test Site EIS, which is referenced in the comment. The Nevada Test Site EIS states, "The extent of the region of influence can vary widely from one resource to another. For example, the region of influence for land use generally includes all impacts on land use in a broad region surrounding the area affected by the program alternatives. The region of influence for groundwater would generally be much smaller, encompassing only those groundwater-flow systems that are affected by the program alternatives, and by all past, present, and future action that have or could affect these groundwater-flow systems" (DIRS 101811-DOE 1996).

The Yucca Mountain EIS sets the Death Valley flow system as the groundwater region of influence because all groundwater in this flow system potentially contributes to the aquifers downgradient from Yucca Mountain. The EIS evaluates all past, present, and reasonably foreseeable future actions that might contribute to impacts to this flow system. It does not, however, attempt to address as cumulative actions any Federal or non-Federal actions in the State of Nevada or even Nye County that are not within the Death Valley flow system. A broader scope of

analysis might have been appropriate for an effort such as the *Special Nevada Report* (DIRS 153277-SAIC 1991; described in Section 8.2 of the Final EIS), but it is not appropriate for the Yucca Mountain EIS.

Section 8.2.3.2.2 of the EIS describes Nye County's perspective on cumulative impacts with respect to groundwater impacts. This paragraph references *Nye County Perspective: Potential Impacts Associated with the Long-Term Presence of a Nuclear Repository at Yucca Mountain, Nye County Nevada* (DIRS 103099-Buqo 1999). The paragraph states that the county's position is that cumulative impacts should include additive contamination as radionuclides ultimately reached the groundwater, constraints on development of groundwater due to land withdrawal, and reduction of water available for Nye County development because of use by Federal agencies. DOE does not believe that the local perspective has been ignored, but does believe that the scope of the cumulative impacts must be defined as, or limited to, those other past, present, and future actions that could actually be cumulative to those of the Proposed Action. In the case of groundwater, this would mean those other actions that could actually affect the same flow system that would be affected by the Proposed Action.

10 (6000)
Comment - EIS001879 / 0027
p. C-9, Section C.2.13

The Draft EIS states "the implementation of the proposed action could potentially affect the water supply in Death Valley National Park, which is down gradient from Yucca Mountain". As such, the region of influence for the water resources impacts of Yucca Mountain clearly extends to the regional discharge point of the groundwater flow system in which it is located. The EIS section on cumulative impacts should be revised to incorporate the larger area of influence.

Response
Section 4.1.3 of the EIS states that the region of influence for groundwater includes "aquifers under the areas of construction and operations that DOE could use to obtain water, and downstream aquifers that repository use or long-term releases from the repository could affect." The affected environment for groundwater therefore includes the pathway that groundwater beneath Yucca Mountain would travel, as well as the downgradient aquifers that might be affected by water withdrawals at Yucca Mountain. As indicated in Section 3.1.4.2.1, the primary discharge point for groundwater flowing beneath Yucca Mountain is believed to be Alkali Flat (Franklin Lake Playa), but DOE recognizes that some groundwater reaching this far might bypass this playa and continue on to Death Valley. In addition, the section notes that a small amount of the groundwater that flows beneath the Amargosa Desert might travel through fractures in the relatively impermeable Precambrian rocks in the southeastern end of the Funeral Mountains toward springs in the Furnace Creek Wash area of Death Valley. In Chapter 5 and Section 8.3.1, potential impacts are evaluated at several distances from Yucca Mountain. The most distant is the primary discharge point at Alkali Flat. Locations farther away, such as Death Valley, would have decreased impacts. In Chapter 8, groundwater impacts from the Nevada Test Site north of Yucca Mountain are considered because these impacts could be cumulative with impacts from a repository at Yucca Mountain.

10 (6044)
Comment - EIS001898 / 0005
The assessment of cumulative impacts in the DEIS does not fully address the impacts associated with past, present, and reasonably foreseeable future actions relating to groundwater use, land use, and cultural and biological resources.
Basis:

A "cumulative impact" is an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.7). A complete cumulative impacts assessment would provide an understanding of whether the Proposed Action might push a resource, ecosystem, or human community beyond a critical threshold and preclude sustainability (CEQ, 1997, page 7). Therefore, the FEIS should assess the additional, incremental impacts from the action at hand when added to impacts from past, present, and reasonably foreseeable future actions (40 CFR 1508.7).

Section 4.1.3 (Environmental Consequences of Repository Construction, Operation and Monitoring, and Closure - Impact to Hydrology) acknowledges that repository construction and operation will impose water demands on the available supplies at Yucca Mountain and the surrounding area. Similarly, Section 6.3.2.1 (Impacts Common to Nevada Branch Rail Line Implementing Alternatives) acknowledges that water withdrawal will be required to support construction of a branch rail line. These demands could create impacts on water resources, particularly in light of other possible future uses. Creation of a Timbisha Shoshone Tribal Homeland with agricultural water rights is a reasonably foreseeable action that could contribute to exceeding the sustainable yield in the Death Valley National Park region (Buqo, 1999, p. 25). Further, it is foreseeable that the continued growth of Clark, Nye, and Lincoln Counties and Las Vegas, Pahrump, and Beatty will impact available groundwater resources. An increased cumulative demand for water, particularly when coupled with reduced water supplies resulting from land withdrawal and Federal land acquisition, could lead to aquifer overdrafting, increased pumping costs, and associated socioeconomic impacts. The cumulative impacts on groundwater resources stemming from the Proposed Action and these other actions are not adequately considered in the DEIS.

The cumulative impacts assessment also needs to further evaluate combined impacts to other specific resources (e.g., the desert tortoise, land use, cultural resources). The cumulative impacts of a Proposed Action, coupled with other Federal actions in the area [e.g., activities at NTS (the Nevada Test Site), Nellis Air Force Range (AFR)] and impacts from extensive growth in Nye, Lincoln, and Clark Counties, on the ranges and habitats of local fauna, such as the desert tortoise, should be documented. In addition, land withdrawal by DOE in conjunction with Department of Interior limitations on land use in Ash Meadows may result in cumulative impacts related to land use that have not yet been fully assessed. Similarly, the impact that private projects such as the Cortez Gold Mine Pipeline projects and the Apex Bulk Commodities Intermodal Transfer Station have on resources (e.g., biological and cultural resources) may not have been fully considered.

Recommendation:

DOE should complete its analysis of cumulative impacts for resources, ecosystems, and human communities by augmenting analyses already performed for individual components for the proposal. The analysis should consider all past, present, and reasonably foreseeable future actions, both Federal and non-Federal, within appropriate spatial and temporal boundaries.

References:

Buqo, T.S. *Nye County Perspective: Potential Impacts Associated with Long Term Presence of a Nuclear Depository at Yucca Mountain, Nye County, Nevada*. June 1999.

Council on Environmental Quality, *Considering Cumulative Effects Under the National Environmental Policy Act*, CEQ, January 1997.

Response

Since the issuance of the Draft EIS, the Department has continued to evaluate actions in the region of influence that could pose a potential cumulative impact. As a result of these reviews, the Department identified several new actions for which information was not available for the Draft EIS. These actions come from several agencies and private companies. For instance, Section 8.1.2.2 of the Final EIS contains an expanded discussion of the Timbisha Shoshone Homeland Act, along with possible implications to groundwater rights. Chapter 8 also contains discussions of other actions by the Bureau of Land Management (e.g., the Ivanpah Cargo Airport, the Moapa Paiute Energy Center); these actions were considered when evaluating the cumulative impacts for the technical discipline areas.

As part of the updated analyses, the Department has expanded the land-use discussion in Chapter 8 to address specifically the known actions that have been identified since the publication of the Draft EIS. Where possible, the Department has identified changes in land use along with estimates of area to be disturbed and possible impacts with other actions in the area. In addition, all discipline areas (for example, biological resources and cultural resources) were reviewed to ensure that the appropriate level of discussion was included to address the potential cumulative impacts of all the actions. However, not all actions could be evaluated to the same level of detail because information was not always available to allow an in-depth evaluation.

10 (6159)
Comment - EIS001654 / 0030
Page S-59. Cumulative Impacts

We support the inclusion of additional analyses relating to cumulative impacts of the Nevada Test Site and other activities affecting the same region as the repository. That is how it must seem to many long-time community residents who have been "living with" the impacts of those other activities. Conducting such analyses and providing them to the community would show an appropriate effort to see things from their perspective rather than "having the blinders on" by looking only at the repository impacts.

We are less certain that it is appropriate to consider emplacement of additional waste beyond the NWPA [Nuclear Waste Policy Act] established maximum quantity of 70,000 tons (Inventory Modules 1 and 2.) We realize that the quantity of material to be disposed may grow to those levels, but there are many uncertainties associated with how and where that will be disposed. While it is a potential additional quantity to be brought to Yucca Mountain it may not be a real-world possibility. It seems speculative to conduct such an analysis for this document.

Response
Since the issuance of the Draft EIS, the Department has continued to evaluate actions in the region of influence that could pose a potential cumulative impact. As a result of these reviews, the Department identified several new actions for which information was not available for the Draft EIS. These actions come from several agencies and private companies.

The consideration in Section 8.2 of additional volumes of nuclear waste beyond that authorized in the Nuclear Waste Policy Act (Inventory Modules 1 and 2) does not presume that disposal of this additional waste in the repository would be approved by Congress. Comments that DOE received from the public during the scoping process for this EIS expressed the concern that more spent nuclear fuel and high-level radioactive waste would be generated than the 70,000 metric tons of heavy metal accounted for in the Proposed Action. DOE acknowledges that the emplacement of Inventory Module 1 or 2 at Yucca Mountain would require legislative action by Congress unless a second repository was in operation.

10 (6575)
Comment - EIS001632 / 0060
Page 8-27, Section 8.2.2.1.2: This section refers to 40 CFR Part 61 which contains EPA's [Environmental Protection Agency's] Clean Air Act regulations for radiological effluents from a variety of facilities; however, this rule is not applicable to Yucca Mountain. More appropriate references are 40 CFR Part 191, Subpart A (Environmental Standards for Management and Storage, 50 *FR* 38066, September 19, 1985) or proposed 40 CFR Part 197, Subpart A (Environmental Standards for Storage), both of which address airborne radiological releases and external exposures from Yucca Mountain during the operational period.

Response
DOE referenced 40 CFR Part 61 primarily because it provided a direct comparison to an air quality emission standard. Since publication of the Draft EIS, the Environmental Protection Agency promulgated *Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada,* at 40 CFR Part 197, which included an annual dose limit to a member of the public of 15 millirem (40 CFR 197.4). In accordance with requirements of the Energy Policy Act, the Nuclear Regulatory Commission subsequently promulgated Yucca Mountain licensing criteria, which includes a Preclosure Public Health and Environmental Standard at 10 CFR 63.204 of 15 millirem per year to a member of the public. The appropriate sections of the EIS (including those mentioned in Chapter 8) have been updated to reflect a comparison to the recently promulgated standard of 15 millirem.

10 (6578)
Comment - EIS001632 / 0061
Page 8-47, Table 8-22: This table and several other tables in section 8 list "MEI [maximally exposed individual] dose (millirem)", but do not indicate whether this dose occurs in one year or over the total closure period. Some of the doses are rather large compared to established radioactive waste standards, such as the 58 millirem listed for the MEI dose for Inventory Module 1 or 2. To properly judge the impact, the exposure period must be specified.

Response
The maximally exposed individual dose values in Table 8-22 of the Draft EIS are the integrated doses over the period of closure; six years each for the high and intermediate thermal-load scenarios and 15 years for the low thermal-load scenario. In Table 8-28 of the Final EIS (the table that corresponds to Table 8-22 of the Draft EIS), the closure period for the Inventory Modules ranges from 12 to 23 years for the higher-temperature and lower-temperature repository operating modes.

10 (6580)
Comment - EIS001632 / 0062
Page 8-66, Table 8-46: For Inventory Module 1, the gross alpha concentration is missing.

Response
The Department has revised the table to include the information on gross alpha concentration in Table 8-49 of the Final EIS.

10 (6581)
Comment - EIS001632 / 0063
Page 8-74, Item 7 and the final paragraph: This item, Greater Confinement Disposal (GCD), does not indicate that there is transuranic radioactive (TRU) waste at the Nevada Test Site, in addition to low-level radioactive waste (LLW). The final EIS should so note since the TRU waste has a greater potential for adding to the impact from Yucca Mountain than does the LLW.

Response
As indicated in Section 8.3.2.1, information on Greater Confinement Disposal on the Nevada Test Site is from the *Final Environmental Statement on the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). DOE included the description as it appears in the Nevada Test Site Final EIS, but DOE did not base its analysis on this description. Rather, the Department relied on the analyses in the Nevada Test Site EIS for input to Chapter 8. The Department acknowledges, however, that transuranic radionuclides are a part of the category of Greater Confinement Disposal, with americium isotopes as one example. The discussion in Section 8.3.2.1 of the Final EIS includes the presence of transuranic radionuclides in this category.

10 (6583)
Comment - EIS001632 / 0064
Page 8-75, Table 8-55: Out of the 9.3 million curies in GCD [Greater Confinement Disposal], tritium and americium are the only ones identified as "major or known isotopes." DOE needs to state the basis for determining a "major isotope."

Response
As indicated in Section 8.3.2.1, information on Greater Confinement Disposal on the Nevada Test Site is from the *Final Environmental Impact Statement on the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). The designation of "major known isotopes or wastes" is intended only to give the reader a broad sense of what would be included in the appropriate waste category and does not affect the analysis in this EIS. The Department relied on the analyses in the Nevada Test Site EIS for input to Chapter 8. As a consequence, DOE did not repeat the detailed composition of the radioactivity at the Nevada Test Site in this chapter.

A footnote to Table 8-53 in the Final EIS clarifies that the table is intended for information purposes only.

10 (6585)
Comment - EIS001632 / 0065
Page 8-77, Section 8.3.2.1.2: This section assumes that the risk of radiological impacts is directly scalable to the radiological content of the waste disposed in the GCD [Greater Confinement Disposal] facility. However, the GCD wastes are disposed in a different manner than that contemplated for the Yucca Mountain repository (namely, closer to ground surface) and the source term likely contains a different mixture of radionuclides than anticipated for disposal at Yucca Mountain; therefore, relating the risk of GCD disposal to its inventory is overly simplistic and should be re-examined.

Response
In response to this comment, DOE has reexamined the discussion of waste subject to Greater Confinement Disposal and has modified Section 8.3.2.1.2 of the EIS to indicate that there is no credible mechanism for the long-term release of materials from the Greater Confinement Disposal to the accessible environment.

The material subject to Greater Confinement Disposal is placed in boreholes that are approximately 37 meters (120 feet) deep; the waste itself is no closer than approximately 21 meters (70 feet) to the surface. DOE has reviewed previous analyses at the Nevada Test Site and has concluded that there is no credible pathway for long-term release of materials by resuspension of nonvolatile radionuclides because the material is sufficiently far below the surface. In addition, evapotranspiration exceeds precipitation in this region and this, coupled with the fact that the boreholes are sufficiently above the water table, indicates that there is no credible scenario for the Greater Confinement Disposal material to enter the groundwater.

10 (6727)
Comment - EIS001878 / 0078
Analysis of shared rail use inadequate. The analysis of the impacts of shared public/private use of DOE branch rail lines is inadequate. (pp. 8-4, -15) The analysis properly belongs in Chapter 6, Transportation Impacts. The statement that predicting increases in rail traffic from shared use would be difficult and, therefore, is not done is unacceptable. The DEIS says there will be impacts, and they must be analyzed, disclosed, and mitigated as necessary. (p. 8-87)

Analysis of impacts on public services inadequate. The DEIS does not adequately address cumulative impacts on emergency response services. The DEIS says that cumulative operations impacts would result because of the extra 14 years of shipping required for Modules 1 or 2 (p. 8-85), but that the DOE expects no cumulative socioeconomic impacts. This conclusion is contradictory and improbable since state, local, and tribal government emergency services would continue to be impacted.

Reasonably foreseeable related actions not disclosed. The DEIS fails to disclose a proposal under consideration by the Nuclear Regulatory Commission to construct an independent spent fuel storage installation at the Skull Valley Indian Reservation in Tooele County, Utah, as described in the *Federal Register* on February 9, 2000. The DOE knew, or should have known, that this project, if approved, would add to the cumulative environmental impacts of the proposed action. Eureka County is especially concerned about this proposal due to its immediate proximity to Nevada and the potential for increased transportation-related impacts on Eureka County and neighboring counties from shipments of SNF [spent nuclear fuel] and HLW [high-level radioactive waste] to and from Tooele County.

The DEIS also fails to disclose the cumulative impacts on Nevada from the proposed action and the Fallon Range Training Complex Requirements, NAS [Naval Air Station] Fallon, as described in the FEIS prepared for that project by the Navy and the BLM [Bureau of Land Management] (January 2000). For example, the DEIS does not disclose that the proposed Carlin corridor would pass through an area at the north end of Big Smoky Valley, southeast of Austin, NV, where the Navy plans to install up to five fixed or mobile electronic warfare sites and a tracking instrumentation subsystem site. Nor does the DEIS disclose that staging areas for training aircraft and enemy aircraft, and air-to-air/electronic warfare training areas associated with NAS Fallon are presently located over portions of the proposed Carlin corridor. (See Exhibit K.) The DOE knew, or should have known, that activities associated with NAS Fallon would add to the cumulative environmental impacts of the proposed action.

Other comments. The failure of Congress to ratify the Nuclear Test Ban Treaty makes the future resumption of nuclear weapons tests more likely. (pp. 8-3, -11, -12) The statement that interim storage was not analyzed for cumulative impacts because it is uncertain is inappropriate; it is reasonably foreseeable and must be included. (p. 8-5) The inadequacies of the air pollution analysis are similar to those in Chapter 4: the discussion is vague and the conclusions unsupported by the evidence, particularly the statement that there will be no effect on the Las Vegas Valley air basin. (pp. 8-24 to 8-30) The statement that the final EIS will review new information from the Pipeline Southeast Expansion Project for cumulative impacts is unacceptable, since the public will not have the opportunity to comment (p. 8-85).

Response
In the case of shared use of a branch rail line in Nevada, the Department believes that the rail line would have benefits for nearby industries and communities in Nevada, as discussed in Section 8.1.2.3 of the EIS. Sharing of the

rail line is, however, speculative at this point, and including these rail lines in the cumulative impact analyses could result in a misrepresentation of those impacts.

With regard to public services, the continuation of operations for an additional 14 years is not expected to result in an increase or decrease in emergency response services. Because the status quo would be expected to be maintained, the Department does not expect socioeconomic impacts to occur. Since issuing the Draft EIS, the Department has reviewed several activities that have become better defined. For example, a discussion of the Private Fuel Storage facility at the Skull Valley Reservation has been added to Chapter 8 of the Final EIS. Other projects/facilities were reviewed but were not included if cumulative impacts were unlikely.

Since 1992, there has been a moratorium on nuclear testing. Even though the Nevada Test Site must maintain the ability to resume testing, the Department does not believe that a resumption of testing is a reasonably foreseeable action. Therefore, it was not included in the analyses in Chapter 8 of the EIS. Nevertheless, a recent evaluation of impacts from a resumption of underground testing at the Nevada Test Site (DIRS 103273-Walck 1996) concluded that the only impact such testing would pose on the repository would be ground motion from the energy released by the detonations. DOE has determined that such effects would not exceed the seismic design criteria for the repository. In other words, the design-basis earthquake for the repository would generate stronger ground motions than would underground nuclear detonations on the Nevada Test Site. Because DOE has designed the repository to survive the design-basis earthquake with minimal damage, ground motion from the resumption of underground testing would be unlikely to result in substantial damage to the surface or underground facilities at Yucca Mountain.

The analysis of air impacts used the best available data. Standard analytical techniques were used to obtain a reasonable estimate of air concentrations and consequent impacts. With no further detail from the commenter, addressing specific concerns about the analysis is not possible.

10 (7115)
Comment - EIS001106 / 0010
Section 8.2.4, page 8-36, on Biological Resources is deficient in two major respects. First, an ecosystem approach was not adopted for the DEIS, and second, thermal loading impacts are not factored into the cumulative effects. Section 8.4.2.4, page 8-89, on Biological Resources and Soils concerning transportation impacts in Nevada appears to address only the intermodal transfer stations and not the routes to be followed through the state. For these various reasons, the section is inadequate. Guidance such as that provided by Clark and Cantor (1977) should have been followed for this section to supplement CEQ's 1997, "Considering Cumulative Effects Under the NEPA."

Response
DOE did not adopt an ecosystem approach for biological analysis in this EIS. An "ecosystem" approach is one method for analyzing potential impacts on biological resources. DOE discusses its evaluation of the ecosystem approach and its reasons for choosing other analytical tools in Section 3.1.5 of the EIS.

The EIS analysis describes the affected environment and potential impacts to the regional ecosystems surrounding Yucca Mountain in Sections 3.1.5.1 and 4.1.4 of the EIS, respectively. The assessment of cumulative biological impacts in Sections 8.2.4 and 8.4.2.4 considered resource management plans and other planning documents for the region, not just the immediate ecosystem surrounding Yucca Mountain. This assessment included the regional ecosystems affected by the other major actions described in Section 8.1. The transportation analysis relied on earlier analyses in National Environmental Policy Act documents and on new analyses specific to this EIS. Appendix J discusses the analysis methods.

10 (7123)
Comment - EIS001106 / 0015
There has been no effort on the DOE's part to integrate environmental documentation for the YMP [Yucca Mountain Project] with other anticipated or ongoing federal activities. In this context, the DOE should address relationships between short-term uses of environmental resources and long-term productivity into the future.

Response
Chapter 8 of the EIS analyzes a range of past, present, and reasonably foreseeable future actions that, along with the repository, could contribute to cumulative impacts. In preparing this chapter, DOE reviewed many documents to

determine where there was potential for cumulative impacts. These documents included resource plans, EISs, environmental assessments, tribal meeting records, and other documents prepared by Federal, local, and private organizations. Section 10.2 addresses the relationship between short-term uses of the environment and long-term environmental productivity.

10 (7152)
Comment - EIS001337 / 0049
In comments to the scope of the EIS, Lincoln County and the City of Caliente urged DOE to consider the cumulative effects which may result from the incremental impact of the proposed action and alternatives thereto when added to other past, present, and reasonably foreseeable future actions. Of particular concern to the County and City was the cumulative effects of exposure to various source terms for radiation within the region. As a component to their comments, the County and City referenced research they had sponsored which determined that consideration of cumulative exposures to radiation is a scientifically defensible undertaking.(14) The County and City recommended that the repository EIS consider the cumulative exposure risk associated with previous DOE weapons testing activities, on-going DOE weapons activities, on-going DOE low-level radioactive waste (LLRW) management activities, potential future LLRW management activities at NTS [Nevada Test Site], potential LLRW transportation activities through Lincoln County, proposed high-level waste transport and disposal in Nevada, and natural and other human-induced sources of background radiation. While the DEIS provides a generic assessment of cumulative risks, the analysis is not transportation corridor, county, or community specific. As a consequence, the assessment of cumulative risk is not useful in discriminating between routing alternatives. Nor does the analysis prove useful in determining where and in what manner risks might best be mitigated.

Consistent with requirements of NEPA [National Environmental Policy Act], the County and City recommended that the repository EIS consider how construction and operation of repository system components within Lincoln County will conflict with existing federal, state and local land use plans, policies, or controls. In particular, the County and City felt that conflicts with the Lincoln County Masterplan and the City of Caliente Masterplan should be evaluated. The DEIS does not consider conflicts with plans developed by Lincoln County or the City of Caliente.

(14) Goble, Robert, Perspectives on Risks from the Nevada Test Site: Feasibility and Methods for Assessing Cumulative Radiological Exposure Risks Associated with Department of Energy Activities at the Nevada Test Site, Center for Technology, Environment and Development of the George Perkins Marsh Institute on the Human Dimensions of Global Environmental Change, Clark University, Worcester, MA. June 1994.

Response
Consistent with Council on Environmental Quality regulations (40 CFR 1508.7), DOE considered past, present, and reasonably foreseeable actions in its assessment of cumulative impacts and has reviewed a number of current and proposed actions to determine relevance. The expression “reasonably foreseeable” refers to future actions for which there is reasonable expectation that the action could occur, such as a proposed action under analysis, a project that has already started, or a future action that has obligated funding.

DOE structured the cumulative impact assessments presented in Chapter 8 of the EIS by identifying actions the effects of which could coincide in time and space with the effects from the proposed repository and associated transportation activities. The actions evaluated in Chapter 8 include some of those recommended by the commenter such as previous underground testing at the Nevada Test Site, low-level radioactive waste disposal at the Nevada Test Site and Beatty, and high-level radioactive waste shipments in Nevada.

The identification of the relevant actions was based on reviews of resource, policy, development, and land-use plans prepared by agencies at all levels of government and from private organizations, other environmental impact statements, environmental assessments, and Native American tribal meeting records. Pursuant to Council on Environmental Quality regulations at 40 CFR 1502.16(c) and 1506.2, in addition to the assessment of potential environmental impacts, the potential conflicts with plans issued by various governmental entities were considered to the extent they provided relevant information. Of particular interest to the commenter, DOE reviewed and considered a number of documents submitted by or prepared for Lincoln County and communities within Lincoln County. Two of the documents reviewed were the City of Caliente Master Plan (prepared by Intertech Consultants and Sweetwater Consulting Services in 1990) and the Alamo Land Use Plan (prepared by Sweetwater Consulting Services and R.O. Anderson Engineering in 1992). While the Alamo plan deals primarily with zoning issues for the

town, the Caliente plan discusses actions for dealing with potential population growth generated by the construction and operation of a repository at Yucca Mountain. The document generally expresses a need to annex lands that are contiguous to and south of the city within Meadow Valley Wash. The Caliente intermodal transfer station would be in Meadow Valley Wash (see Figure 6-17 of the EIS). The commenter is also referred to Sections 6.3.2 and 6.3.3 of the EIS, which provide estimates of changes in population and other economic measures for each relevant implementing alternative. The transportation analysis in the Final EIS includes a sensitivity analysis that assigns all potential impacts to Caliente. The analysis conservatively estimates the potential transportation actions on a community level. However, definitive information is not available on specific tracts of land that could be required for a specific transportation mode or route. Once DOE selected a transportation mode and specific transportation corridor, more definitive information would be developed on potential conflicts with land uses and various agency plans and policies and ultimately the mitigation measures that could resolve conflicts and impacts on a given area.

DOE agrees with the commenter that the cumulative impacts of radiological exposures can be scientifically based. Section 3.1.8.2 of the EIS estimates the annual radiation dose to a hypothetical individual in Springdale, Nevada, from airborne radioactive materials from past nuclear weapons testing at the Nevada Test Site, and indicates that DOE had made quantitative estimates of the offsite doses from releases from past weapons testing at the Nevada Test Site (DIRS 146592-Black and Townsend 1998). Section 6.3 of the EIS describes the potential impacts of each transportation alternative in Nevada, including estimates of impacts to health and safety in Nevada from incident-free waste transport to Yucca Mountain and from transportation accidents, as well as regional socioeconomic impacts to potentially affected counties (see Figures 6-5 through 6-8).

Section 8.4 of the EIS analyzes potential cumulative impacts in Nevada from the Proposed Action and other past, present, and reasonably foreseeable future actions by Federal agencies and private groups. The analyses include transportation impacts from the Expanded Use Alternative (Alternative 3) for the Nevada Test Site. This alternative includes the shipment of low-level radioactive waste to the Nevada Test Site from offsite locations [based on the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996)]. Section 8.2.12.2 of the Yucca Mountain EIS discusses the cumulative impacts from storage of low-level waste and includes as a reasonably foreseeable action of the potential that the Nevada Test Site would be selected as a regional DOE low-level waste disposal site. Table 8-58 of the EIS summarizes cumulative transportation-related radiological impacts from the Proposed Action, Inventory Modules 1 and 2, and other Federal, non-Federal, and private actions nationwide from 1943 to 2047. The table lists potential impacts from past, current, and projected Federal waste transport activities, including shipments of low-level waste to the Nevada Test Site, shipments of transuranic waste to the Waste Isolation Pilot Plant in New Mexico, and shipments of spent nuclear fuel and high-level radioactive waste to various storage and disposal sites throughout the Nation. In response to public comments, Appendix J of the EIS now contains maps showing routes used in analyzing impacts and provides estimates of radiological and nonradiological impacts for each state. This is in addition to the route maps that were included in the Draft EIS (see Section 2.1.3.2 of the EIS for national routes and Section 2.1.3.3 for Nevada maps). Based on this information, DOE has concluded that the cumulative impacts of future transportation activities, past nuclear-weapons testing, and other Federal and private programs involving transportation of radioactive materials in the State of Nevada would be small.

10 (7362)
Comment - EIS001106 / 0029
The Yucca Mountain DEIS is deficient in terms of best professional practice for EIA [environmental impact assessment] because natural ecosystem and landscape boundaries were not adopted. Programs as important as the YMP [Yucca Mountain Project] is in terms of long-lived contaminants and future human generations require regional planning and execution in the context of ecosystems and regional landscape boundaries. Otherwise, long-term and cumulative impacts cannot be addressed adequately. In terms of holistic environmental quality and EIA, the YMP DEIS is deficient as a NEPA [National Environmental Policy Act] document.

Response
The EIS considered the regional ecosystems surrounding Yucca Mountain based on resource management plans and other planning documents for the region (see Sections 3.1.5.1 and 4.1.4). The assessment of cumulative impacts in Chapter 8 considered not only the immediate ecosystem surrounding the proposed repository, but also the regional ecosystems affected by the other major actions described in Section 8.1.

10 (7369)
Comment - EIS001106 / 0032
In programs such as the YMP [Yucca Mountain Project] it is necessary that potential conflicts between future projects be addressed in a reasonably foreseeable manner. The Yucca Mountain region in particular is susceptible to such long-term impacts that have to be addressed in a context of ecosystem management. Such is among the intents of the existing Five-Party Cooperative Agreement for the region that the DOE has refused to adopt for the YMP.

Response
The five-party Cooperative Agreement coordinates and enhances management of natural resources in the Great Basin and Mojave Desert ecosystems on the Nellis Air Force Range, Desert National Wildlife Range, and the Nevada Test Site. The five agencies are DOE's Nevada Operations Office (operator of the Nevada Test Site), the U.S. Air Force (operator of the Nellis Air Force Base), the Bureau of Land Management's Las Vegas Field Office, the U.S. Fish and Wildlife Service, and the State of Nevada.

DOE agrees that it is important to interact with other agencies to minimize conflicting programs or actions. Appendix C of the EIS describes DOE's agency interactions. One of the purposes of these interactions is to discuss issues of concern with organizations that have an interest in or authority over land that repository-related actions could affect or with some other interest the Yucca Mountain Project could affect. In addition, DOE has solicited and documented input from stakeholder groups through the EIS scoping process, comments on the Draft EIS, and other means. These interactions are described in the *Summary of Public Scoping Comments Related to the Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nevada* (DIRS 104630-YMP 1997) and in this Comment-Response Document.

Chapter 8 of the EIS estimates the potential cumulative impacts associated with various agency actions in the defined region of influence. The actions identified were based on documents issued by, and discussions with, DOE's Nevada Test Site, the U.S. Air Force, the Bureau of Land Management, the U.S. Fish and Wildlife Service, and the State of Nevada. The documents include resource management plans, EISs, environmental assessments, strategic plans, consultation documents, and tribal meeting records.

If the repository was recommended and approved for development, DOE would consider including the Yucca Mountain Project in the Cooperative Agreement, and would reevaluate the need for a site-specific land-use plan to ensure compliance with all applicable requirements. That plan, based on the principles of ecosystem management and sustainable development, would formally synthesize the Yucca Mountain Project policies and procedures already in place; draw on the successes of the Resource Management Plan for the Nevada Test Site; and solicit input from Federal and State agencies, stakeholders, and the general public.

10 (7374)
Comment - EIS001106 / 0035
The intent of NEPA [National Environmental Policy Act] is that contributions to global environmental problems be avoided. Global environmental "commons" such as the atmosphere applies to the YMP [Yucca Mountain Project] in the context of radioactivity and must be addressed by competent EIA [environmental impact assessment] in the DEIS. This in particular is an issue regarding future cumulative impacts and future generations.

Response
The repository EIS does not report global adverse impacts because such impacts would be negligible. As stated by the National Academy of Sciences "..the most likely pathway for global distribution are gaseous releases of carbon dioxide containing the radioactive isotope of carbon-14, that eventually will escape from the waste containers, or by widespread distribution of foodstuffs grown with contaminated water." However, the Academy stated, "In general, the risks of radiation produced by such wide dispersion are likely to be several orders of magnitude below those to a critical group." For example, the Academy estimated that the average dose to members of the global population, based on the release of 91,000 curies of carbon-14, is 0.0003 millirem per year, and equated that to an annual risk of fatal cancer of 1.5 in 10 billion (DIRS 100018-National Research Council 1995). For comparison, the individual dose standard set by the Environmental Protection Agency in 40 CFR Part 197 of 15 millirem per year for the maximally exposed individual is 50,000 times that dose.

Because of large uncertainties, DOE considers estimates of global health effects to be highly speculative and, therefore, did not estimate global collective doses or health effects in the EIS. However, DOE agrees with the Environmental Protection Agency (64 *FR* 46976, August 27, 1999) and the National Council on Radiation Protection and Measurements (DIRS 101858-NCRP 1995) that optimizing the protectiveness of design alternatives merits the estimation of population doses. The Department believes it can obtain information important to design optimization by estimating collective dose to the regional populations within 80 kilometers (50 miles) of the repository, thereby precluding the need to perform the more speculative global health risk calculations. For these reasons, the EIS evaluated in detail potential radiological exposures to the maximally exposed individual and regional populations (80 kilometers) from both groundwater and atmospheric pathways. Sections 5.4 and 5.5 of the EIS describe the results of these evaluations for waterborne and atmospheric releases, respectively.

10 (7413)
Comment - EIS001912 / 0008
The DEIS does not consider the impact of underground weapons testing on regional groundwater resources. Additionally, the impact assessment does not consider the collective impact of all actions added together. Instead the analysis only looks at the proposed action added to a single cumulative action. The approach taken in the DEIS is inconsistent with the Council on Environmental Quality regulations.

Response
Section 3.1.8 of the Final EIS discusses estimates of radiation doses to individuals from past weapons testing on the Nevada Test Site. DOE has included this information in Sections 8.2.2.2.2 and 8.2.4.7 as contributing to short-term cumulative radiological impacts. Sections 8.2.2.2.2 and 8.2.4.7 now include information on radiation exposure from past nuclear weapons testing, and Section 8.3 includes updated estimates of future impacts to groundwater and air resources from activities on the Nevada Test Site. Section 8.2.4.7 incorporates the human health impacts from transportation discussed in Section 8.4. In addition, DOE has revised Chapter 8 to present the information more clearly and to clarify that it did consider the cumulative effects of all actions taken together.

In addition to the foregoing, the assessment of impacts of past nuclear weapons testing is part of an ongoing effort by several organizations, including the National Cancer Institute and the Centers for Disease Control. Readers interested in further information about the effects of past testing of nuclear weapons should refer to the *National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans From Nevada Atmospheric Nuclear Bomb Tests* (DIRS 152469-Institute of Medicine and National Research Council 1999).

10 (7443)
Comment - EIS001969 / 0004
Cumulative environmental effects from the future operation of the Yucca Mountain repository and past activities at the NTS [Nevada Test Site] are also of concern. Possible impacts to groundwater and spring discharges resulting from activities at NTS, approximately 25 miles north of Ash Meadows NWR [National Wildlife Refuge], are being evaluated by DOE, the Service and the U.S. Geological Survey (USGS). Activities at the NTS which may have resulted in contamination of the region include both atmospheric and subterranean tests of nuclear devices and other tests involving radioactive materials, controlled atmospheric releases of numerous gaseous materials, and disposal and destruction of various types of solid and liquid wastes. The extent to which these activities have placed wildlife resources at risk is still under investigation. DOE's Environmental Management Program is focused on identifying the nature and extent of contamination from the nuclear weapons programs at DOE facilities. This process is underway at the NTS with ongoing environmental restoration and waste management activities.

Response
This comment accurately summarizes some of the issues involving the potential cumulative impacts associated with the Proposed Action and some of the ongoing evaluations being conducted by the Department and other agencies, including the U.S. Fish and Wildlife Service. In preparing Chapter 8 of the EIS, the Department reviewed many past, present, and reasonably foreseeable future actions to determine where there was potential for cumulative impacts. Chapter 8 of the EIS describes both the short-term and long-term impacts of the proposed repository, along with transportation and manufacturing cumulative impacts.

10 (7582)
Comment - EIS001909 / 0004
Section 8.1.2.1

"Inventory Modules 1 and 2 represent the reasonably foreseeable future actions of disposing of all projected commercial and DOE spent nuclear fuel and all high-level radioactive waste as well as Greater-Than-Class-C waste and Special-Performance-Assessment-Required waste in the proposed repository (see Figure 8-1)."

The DEIS fails to account for the cumulative impacts of HLW [high-level radioactive waste] and DOE SNF [spent nuclear fuel] depicted in Inventory Module 1 and Inventory Module 2 (Figure 8-1) which are not disposed of in the proposed Yucca Mountain repository. These cumulative impacts should be addressed in the DEIS.

Response
The EIS analyzes a Proposed Action to construct, operate and monitor, and eventually close a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste at Yucca Mountain. The cumulative impacts are limited to those that would overlap in space and time with impacts from the repository. Therefore, the impacts of materials not disposed of at Yucca Mountain would not contribute to the cumulative impacts of the repository. For the No-Action Alternative, DOE evaluated the impacts of retaining spent nuclear fuel and high-level radioactive waste at existing sites or at sites where Records of Decision would move these materials. For example, in the Record of Decision for the *Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility* (60 *FR* 18589, April 12, 1995), DOE decided to complete construction and operate the Defense Waste Processing Facility at the Savannah River Site to pretreat, immobilize, and store high-level radioactive waste. Similarly, the preferred alternative of the *Hanford Site Final Environmental Impact Statement for the Tank Waste Remediation System* (DIRS 103214-DOE 1996) was to vitrify high-level radioactive waste and store it onsite until final disposition in a geologic repository. In the Record of Decision (60 *FR* 28680, June 1, 1995) for the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement*, DOE decided to keep production reactor fuel at the Hanford Site, consolidate aluminum-clad fuel at the Savannah River Site, and transfer non-aluminum-clad fuels (including spent nuclear fuel from the Fort St. Vrain reactor and naval spent nuclear fuel) to the Idaho National Engineering and Environmental Laboratory.

DOE will continue to make decisions on the types and quantities of materials it will move, as well as the timing of these activities, in programmatic documents. The EISs on these actions contain evaluations of impacts related to these decisions.

10 (7594)
Comment - EIS001912 / 0072
The cumulative impact analysis considers a repository with much higher volumes of waste. This scenario should be included in Chapter 5 and not the cumulative impact section. Congress did limit the amount of waste which could be stored in the repository. However, by including a high waste volume scenario in the cumulative impact section assumes that laws will be changed to accommodate a greater amount of waste. If such an assumption is made for the cumulative impact analysis why couldn't it be made for the proposed action? Furthermore, an EIS can consider other alternatives not specifically authorized by Congress.

Response
The Proposed Action described in this EIS considers a volume of spent nuclear fuel and high-level radioactive waste (70,000 MTHM) that could be disposed of in accordance with the NWPA.

The analysis of cumulative impacts must include past, present, and reasonably foreseeable future actions. Future actions include reasonably foreseeable actions, even though these actions are not certain to occur. After considering public scoping comments, the Department determined that the disposal of additional, compatible wastes in the repository to be reasonably foreseeable and has considered the impacts of this action in Chapter 8.

The consideration in Section 8.2 of additional volumes of nuclear waste beyond that authorized in the Nuclear Waste Policy Act (Inventory Modules 1 and 2) does not presume that disposal of this additional waste in the repository would be approved by Congress. Comments that DOE received from the public during the scoping

process for this EIS expressed the concern that more spent nuclear fuel and high-level radioactive waste would be generated than the 70,000 metric tons of heavy metal accounted for in the Proposed Action. DOE acknowledges that the emplacement of Inventory Module 1 or 2 at Yucca Mountain would require legislative action by Congress unless a second repository was in operation.

10 (7629)
Comment - EIS001912 / 0104
The cumulative analysis must assume loss of institutional control to be parallel with the analysis in the no-action alternative.

Response
The institutional control assumptions in the cumulative impact evaluation are essentially the same as those for the impact evaluations of the Proposed Action and the No-Action Alternative. Scenario 1 of the No-Action Alternative includes an analysis of impacts under effective institutional control for at least 10,000 years and is consistent with the portion of the analysis of the Proposed Action that includes an analysis of effective institutional control for the first 100 years after closure. The Scenario 2 analysis of the No-Action Alternative does not consider effective institutional control after approximately 100 years and is parallel to the portion of the Proposed Action analysis in which long-term performance after 100 years also does not include institutional control. The cumulative impact analyses for Modules 1 and 2 used these same assumptions (see Chapter 8 of the EIS).

In the evaluation of cumulative impacts from other Federal, non-Federal, and private actions, such as underground testing at the Nevada Test Site and low-level radioactive waste disposal at the Nevada Test Site and Beatty, assumptions related to the loss of institutional control were based on the best available information. For these actions, in general, credit was not taken for future institutional controls past the point in time when remediation activities would be complete. In all cases identified, planned remediation actions would be complete within 100 years.

10 (7803)
Comment - EIS001227 / 0002
In reference to the Nellis range renewal Legislative EIS a statement appears at the top of page 8-10. This statement includes "[t]he Air Force is proposing no substantial new activities in the future…" I suggest that the change of hands for approximately 144,640 acres, that the Air Force has proposed in the LEIS, is potentially substantial and this issue should be fully covered in the Yucca Mountain Final EIS.

Adjacent Nuclear Testing Effects Poorly Understood and Poorly Reported

In the last paragraph of Section 8.3.2.1 (Page 8-74) was the suggestion that the cumulative effects from surface radioactive contamination at the Nevada Test Site was unimportant due to a less-than-40-curie source term. This needs some closer examination, especially in the light that much of the contamination debris resulting from nuclear explosives testing is still shrouded in secrecy, ostensibly to prevent the proliferation of nuclear weapons.

First, [it's] helpful to understand that each nuclear explosive is essentially a miniature nuclear reactor that is designed to "burn" a portion of its nuclear fuel in less than one microsecond, rather than in the two to three year time period common to nuclear power reactors. As with nuclear power reactors, the "burn" or fission process results in the production of spent fuel debris containing fission products such as cesium-137 and strontium-90 along with substantial quantities of unfissioned fuel debris. One significant difference in the composition of most nuclear explosion debris is that it almost always contains between one to three kilograms of plutonium-239. The spent nuclear fuel that may end up at Yucca Mountain would contain plutonium-239 concentrations of only around 1/2%. The spent fuel that may be brought to Yucca Mountain is subject to strict engineered containment standards. The spent nuclear fuel that was generated by approximately 1,021 nuclear detonations at the Nevada Test Site was not subject to anything like the power reactor and Yucca Mountain containment standards. It was blasted into the environment, be that the atmosphere or the underground environment. Effectively, the Nevada Test Site was the location of over one-thousand nuclear reactor explosions. At the Nevada Test Site 100 nuclear test explosions were conducted in the atmosphere.

Underground, 921 detonations were conducted.

One estimate is that approximately 260 of those detonations were conducted below the local water table or within 100 meters above it.

Since the vast majority of these explosions had high-energy-yields, much of the radioactive debris generated and released by the above groundwater explosions, ended up below or just above the existing water table. Unlike the Yucca Mountain site, no research has gone into looking at the possible rise of groundwater in the underground nuclear testing areas of the Nevada Test Site. The blown-up nuclear reactors in these areas will not be analyzed to see how many thousands of years it will take before their containers have corroded through. The radioactive debris has already been scattered. Most of it is contained in a highly heterogeneous glassy matrix, a material is quite different from the laboratory grade borosilicate glass that high-level nuclear waste is required to be encased in.

The nuclear explosives that were detonated in the atmosphere were not significantly different from those detonated underground and one result is that the radioactive debris released by each of those explosions was similar. Notice on page 8-75 that the radionuclide release estimate for the 921 detonations conducted underground is 300 million curies. The estimated source term amount left on the surface by 100 atmospheric tests, a couple of dozen shallow underground tests, plutonium dispersal tests ("safety tests"), and rocket and jet tests, was less-than-40-curies. It is worth asking the question, if approximately 15% of the tests were conducted in the atmosphere, then why isn't the surface source term closer to 45 million curies rather than 40 curies? What happened to approximately 45 million curies of radioactive debris? I believe a part of the answer lies in inaccurate surface radiation surveys and a failure to look for, or detect, plutonium that now lies slightly below the surface. Still, a goodly portion of the nuclear explosion debris drifted down-wind to fall out all over our nation.

This section of the Yucca Mountain Draft EIS mentions the lack of contamination data associated with the underground nuclear test areas. I believe that part of the dearth of information is due to the fact that much information on the vast majority of the underground nuclear tests still remains classified. In addition, the DOE has limited access to the sources of contamination so little external analysis of this subject can be performed. NEPA [National Environmental Policy Act] analysis of the Yucca Mountain potential repository situation should not be hindered by information restrictions associated with adjacent past and on-going DOE nuclear weapons programs. Each and every time an analysis is hindered by such programs the public and the public's elected representatives should be duly informed via open media presentations. The public has a right to know when governmental agencies are withholding information from them. The recently reported incidents at the uranium enrichment plant at Paducah, Kentucky are not unusual. The AEC [Atomic Energy Commission] and DOE have a lengthy record of putting production missions ahead of local health and safety. Deceiving workers and local residents with vague and deceptive terms has become second-nature to generation after generation of DOE functionaries. The draft EIS failed to mention that the DOE continues to explosively disperse small quantities of plutonium-239 in underground rooms at the Nevada Test Site as part of its subcritical test program. Nor did it mention that the DOE has no firm plan in place to remediate that contamination upon the conclusion of the test series.

The Cumulative Impacts section should have also mentioned that the nuclear debris produced and dispersed by underground nuclear explosions is not covered by the U.S. Environmental Protection Agency's regulations that are associated with Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste.

The Code of Federal Regulations, Title 40, Section 191.3, involving containment requirements, does not apply to this form of spent nuclear fuel. In addition, the Section 191.14 containment assurance requirements do not apply. This includes the strict requirements to mark the debris sites and prevent human intrusion.

Draft EIS, Section 8, on the cumulative impacts, largely treated the nuclear explosion tests impacts as something that happened in the past. It failed to mention that since the remaining debris contains large quantities of plutonium-239 the hazard from the dispersed debris will continue for a longer period than for the power reactor spent fuel material that is proposed for burial at Yucca Mountain. This section barely mentioned the fact that the Nevada Test Site is being kept ready so that the underground nuclear explosive testing program can be resumed in the event that such a need is deemed necessary. This is an issue which was given only very minor coverage in the 1996 Nevada Test Site EIS. It is an issue that certainly should have been covered in some detail in the Yucca Mountain Draft EIS. Surely, this issue deserves substantial coverage in the Final EIS for the proposed Yucca Mountain repository.

In 1987, the President's Council on Environmental Quality (CEQ) issued a guidance handbook that described how to analyze cumulative impacts and prepare the necessary NEPA reports on this issue.

This guidance should have been used in the preparation of the Yucca Mountain Draft EIS. NEPA cumulative impact review guidance was recently issued by the U.S. Environmental Protection Agency (EPA).

Both these documents should have been utilized in reviewing the adequacy of the Cumulative Impacts section of the Yucca Mountain Draft EIS.

Response

This comment expresses four general concerns: (1) the effect of a land transfer discussed in the *Renewal of the Nellis Air Force Range Land Withdrawal: Legislative Environmental Impact Statement* (DIRS 103472-USAF 1999), (2) the adequacy of the inventories used to assess the contribution of nuclear testing to cumulative impacts, (3) the applicability of regulations and standards to the contents of the repository, (4) compliance of the cumulative impact analysis with the requirements of the National Environmental Policy Act.

DOE has made several changes to Chapter 8 of the EIS. These changes deal in particular with concerns 2 and 4 listed in the preceding paragraph. The following paragraphs discuss the four concerns.

1. Transfer of Land Discussed in the Nellis Air Force Base Legislative EIS

The comment apparently refers to two parcels of land with a total size of approximately 580 square kilometers (225 square miles). The first parcel, known as Pahute Mesa, is part of Public Land Order 99606, which was withdrawn for the use of Nellis Air Force Base but has been used historically by the Nevada Test Site for underground testing under a Memorandum of Understanding. This parcel is in the upper northwest corner of the Nevada Test Site. The second parcel, known as the Groom Range, is part of Public Land Order 01662, which provided land for nuclear testing activities by the Atomic Energy Commission (a DOE predecessor agency). This parcel has been used historically by Nellis Air Force Base for flight operations under an understanding with the Nevada Test Site. The land transfer referred to in the Air Force's Legislative EIS (accomplished by recent legislation) was merely a transfer of jurisdiction to match actual use with ownership. That is, Pahute Mesa was transferred to the Nevada Test Site and the Groom Range was transferred to the Air Force. Because this entails no change in activities from those evaluated in this EIS, there would be no effect on cumulative impacts.

2. Inventories from Testing

Section 8.3.2.1 of the EIS describes the activities on the Nevada Test Site that could contribute to cumulative impacts with the proposed repository. Since issuing the Draft EIS, DOE has revised some of the analyses of impacts associated with the Nevada Test Site. Sections 8.2.2.2 and 8.2.7 now include additional information on radiation exposure from past nuclear weapons testing. These revisions include consideration of the subcritical tests mentioned in the comment. In relation to atmospheric testing inventories, most of the material probably dispersed as fallout over the entire world. This was a major reason for the use of underground testing. In relation to the form of contamination, the analysis assumed that the radioactive material had no containment and was readily available for transport. The revised groundwater transport calculations took credit for immobilization. The analysis also assumed that the dissolution rate of the glass matrix in underground detonation points on the Nevada Test Site is not remarkably different than that of commercial spent nuclear fuel analyzed in the *Viability Assessment of a Repository at Yucca Mountain* (DIRS 101779-DOE 1998).

The National Environmental Policy Act requires that an agency use the best available data and methods to prepare an EIS. DOE used the best available data for the Draft EIS and for the revised analysis in the Final EIS. Where these data were incomplete or highly uncertain, the Department used conservative assumptions.

3. Applicability of Regulations and Standards

The commenter says that the EIS should acknowledge that radioactive materials on the Nevada Test Site, unlike repository materials, are not subject to the provisions of 40 CFR Part 191. In fact, neither site is subject to this standard. In 1985, the Environmental Protection Agency issued 40 CFR Part 191 as the performance standard for

high-level radioactive waste repositories. The Federal courts subsequently remanded the regulation to the Environmental Protection Agency for reconsideration. Further, the Energy Policy Act of 1992 required the Environmental Protection Agency to develop radiation protection standards specific to Yucca Mountain. In response to these events, the Environmental Protection Agency promulgated regulations at 40 CFR Part 197 (*Environmental Radiation Protection Standards for Yucca Mountain, Nevada*). The protection standards in 40 CFR Part 197 provide the same level of protection as those in 40 CFR Part 191. However, in other ways, the new rule is quite different from 40 CFR Part 191. A key difference is that the new rule does not contain a release standard based on cumulative curie amounts of specific radionuclides, relying instead on the individual protection and groundwater protection standards.

In dealing with cumulative impacts, the analysis in the Draft EIS did not consider the standards for other past, present, and future activities. Rather, it assessed the actual impacts and combined them with the projected impacts of the Proposed Action. For the sake of perspective, the EIS discusses standards (such as 40 CFR Part 197) to enable informed judgment of the magnitude of potential impacts. If the Yucca Mountain site was recommended and approved, the repository License Application and its supporting compliance analysis would make direct comparisons to the standard. The analysis combined the effects of nuclear testing with projected releases from the repository, analyzed those effects for the same performance measures, and assumed the effects would arrive at the same time (for maximally conservative results) and would migrate to the biosphere in the same manner. Thus, comparisons of the cumulative impacts probably would be made to the same standard. The EIS compares nuclear test debris to the same standard used for the repository. However, demonstration of compliance with the standard would consider only material released from the repository. Section 8.3 of the Final EIS now discusses this issue.

4. Analysis of Cumulative Impacts under the National Environmental Policy Requirements

In general, the analysis of cumulative impacts in Chapter 8 followed the process recommended in the Council on Environmental Quality's handbook *Considering Cumulative Effects Under the National Environmental Policy Act* (DIRS 103162-CEQ 1997). This process included the identification, through research and consultations, of Federal, non-Federal, and private actions with possible effects that would be coincident with those of the Proposed Action on resources, ecosystems, and human communities. DOE believes the analysis of cumulative impacts meets all National Environmental Policy Act provisions and implementing regulations (40 CFR Part 1500 *et seq.* and 10 CFR Part 1021). The documents mentioned in the comment contain guidance rather than regulations. However, DOE has revised Chapter 8 of the Final EIS to provide a clearer presentation of cumulative impacts consistent with established regulations. The presentation contains a more detailed analysis of activities at the Nevada Test Site, as discussed above.

10 (7805)
Comment - EIS001653 / 0007
The DEIS does not consider the impact of underground weapons testing on regional groundwater resources. Additionally, the impact assessment does not consider the collective impact of all actions added together. Instead the analysis only looks at the proposed action added to a single cumulative action. The approach taken in the DEIS is inconsistent with Council on Environmental Quality (CEQ) regulations.

Response
Section 8.3.2 discusses the impacts of underground weapons testing on regional groundwater resources. In Chapter 8 of the Final EIS, DOE clarified the discussion in the Draft EIS on the additive effects of past, present, and future actions.

10 (7853)
Comment - EIS001227 / 0004
Include Conceptual Plans

Conceptual plans for the remediation of the underground test areas should have been included in the Cumulative Impacts section.

For example, one remedial cost estimate was put at $7.29 trillion dollars and would involve the largest open-pit mining operation in the world. Certainly this would represent more than a insignificant cumulative impact. The

plan included a conceptual proposal to pipe massive quantities of groundwater through the proposed Yucca Mountain repository area. That certainly should have been in the Draft EIS and should be explained, in detail, in the Final Yucca Mountain EIS.

Response
DOE has not proposed to proceed with the kind of major remediation project such as that described by the commenter. Should DOE propose to pursue a specific goal for remediation of the underground test area at the Nevada Test Site, the Department would undertake appropriate environmental review for such a proposal including analysis of alternative means for accomplishing that remediation. At this time, however, an evaluation of the environmental impacts (including cumulative impacts) of undefined, potential management approaches at the underground test area would be largely speculative. This EIS does analyze cumulative impacts from potential future releases from the Nevada Test Site, assuming no remediation (see Section 8.3.2.1). Remediation of the Nevada Test Site would further reduce these small cumulative impacts.

10 (8113)
Comment - EIS001653 / 0071
The cumulative impact analysis considers a repository with much higher volumes of waste. This scenario should be included in Chapter 5 and not the cumulative impact section. Congress did limit the amount of waste that could be stored in the repository. However, by including a high waste volume scenario in the cumulative impact section assumes that laws will be changed to accommodate a greater amount of waste. If such an assumption is made for the cumulative impact analysis why couldn't it be made for the proposed action?

Response
The consideration in Section 8.2 of additional volumes of nuclear waste beyond that authorized in the Nuclear Waste Policy Act (Inventory Modules 1 and 2) does not presume that disposal of this additional waste in the repository would be approved by Congress. However, DOE considers the possibility to be reasonably foreseeable. Therefore, it is appropriate to examine the impacts of this additional waste under cumulative impacts, rather than under the Proposed Action.

10 (8176)
Comment - EIS001653 / 0102
The cumulative impact analysis does not consider the collective impact of all actions taken together. Instead it looks at only the proposed action with one other action at a time. This approach does not comply with CEQ [Council on Environmental Quality] regulations. Please explain.

Response
While DOE analyzed the collective impact of all actions together, it acknowledges that the presentation in Chapter 8 of the Draft EIS should have been clearer. Therefore, DOE has revised Chapter 8 to include summary sections that clearly indicate the contribution (or lack of contribution) from each activity to the cumulative impacts.

10 (8189)
Comment - EIS001873 / 0012
The proposal to ship low-level nuclear waste via an intermodal station at Caliente is directly linked to the similar proposal for high-level waste in that establishment of the former facility, primarily as an alternative to avoid shipment through Las Vegas, could weigh heavily in the eventual choice of a Caliente high-level waste corridor. For this reason the cumulative impacts of both projects need more than the slight attention they receive in the DEIS. Caliente will likely receive either all or none of the combined impacts, and more information is needed on transportation risks, especially under socioeconomic impacts. All of the above issues are examples of the factors that DOE must set forth for the decisionmakers. Lincoln County and Caliente are representative of communities, not just in Nevada but in 43 states, whose concerns must be addressed. It is no surprise that DOE has deferred considering the transportation issue. A decision to designate Yucca Mountain will impact millions of people. Failure to face the transportation issue will not make it go away.

Response
The potential impacts of each transportation alternative in Nevada are described in Section 6.3 of the EIS. Included are estimates of impacts to health and safety in Nevada, as well as regional socioeconomic impacts to potentially

affected counties, including Lincoln County. Section 8.4.2 analyzes potential cumulative impacts in Lincoln County and elsewhere in Nevada from the Proposed Action and other past, present, and reasonably foreseeable future actions by Federal agencies and private groups. Table 8-58 summarizes cumulative transportation-related radiological impacts from the Proposed Action, Inventory Modules 1 and 2, and other Federal, non-Federal, and private actions nationwide. The table considers potential impacts from current Federal waste-transport activities. These include shipments of low-level waste to the Nevada Test Site, shipments of transuranic waste to the Waste Isolation Pilot Project in New Mexico, and shipments of spent nuclear fuel and high-level radioactive waste to various storage and disposal sites throughout the nation from 1943 to 2047. The Final EIS includes maps of each state showing the routes DOE used in its analysis of impacts in the Draft EIS.

10 (8446)
Comment - EIS001397 / 0014
Over 1,000 nuclear bombs have been detonated at the Nevada Test Site [NTS], above, below and directly within existing water sources. The cumulative effect of NTS radiation contamination in conjunction with Yucca Mountain contamination on the regional aquifers is not addressed in the DEIS at all. Use of potentially contaminated waters to form concrete barriers is not addressed at all. Excessive pumping of aquifers and how this might affect water flow [or] contaminate waters to surrounding communities and ranches and farms is not addressed. This must be rectified completely within the final document.

Response
Chapter 8 of the EIS discusses the impacts to groundwater from past activities on the Nevada Test Site. Sections 8.2 and 8.3 describe short- and long-term cumulative impacts from the repository and other past, present, and reasonably foreseeable actions. Section 8.2.3.2 addresses cumulative short-term impacts to groundwater, including impacts from other Federal and non-Federal actions. These impacts relate primarily to the cumulative consumption of groundwater. Section 8.3 describes the cumulative long-term impacts from contaminant migration from the proposed repository, the Test Site, and the Beatty low-level waste site.

DOE recognizes that some radionuclides or potentially toxic chemicals would eventually enter the environment outside the repository. The regional flow model prepared by the U.S. Geological Survey (DIRS 100131-D'Agnese et al. 1997) suggests that some of the water from the Nevada Test Site flows to the south toward the Amargosa Desert in the vicinity of Yucca Mountain, but the actual transport times and the groundwater pathways from radionuclide contaminants on the Test Site are not clear at this time. Section 8.3.2.1.1 contains a qualitative calculation of the cumulative radiological impact from the Test Site and Yucca Mountain. As indicated, the potential cumulative peak dose for 10,000 years would be well below the regulatory limits established by the Environmental Protection Agency in 40 CFR Part 197. This combined peak dose would occur only if the peak concentrations from the Nevada Test Site and Yucca Mountain occurred at the same time and same location, which would be unlikely.

With regard to the current quality of the groundwater at Yucca Mountain, there is no evidence to suggest that this water has been contaminated by past activities on the Nevada Test Site. See Section 3.1.4.2.2 of the EIS for more information.

Section 4.1.3 discusses water for the repository and the resulting impacts to water availability. In brief, water consumption for the repository could lower the local water table. Additional water consumption in upgradient groundwater areas on the Nevada Test Site could, to some extent, decrease the availability of water in the Amargosa Desert. The amount of water needed for the repository, however, would be small compared to current water consumption in the Amargosa Desert. Therefore, the Proposed Action would have little impact on the availability of water in the region.

Section 5.4 describes the long-term migration of contaminants from the repository.

10 (8499)
Comment - EIS000817 / 0162
P. 8-10. Two spaceports? VentureStar? Kistler Aerospace Satellite Launch? And recovery? So how does all this activity relate to airplane crash analysis into dry cask storage? What could possibly crash into a full cask array on several pads of casks at Yucca Mountain? What all flies over that area from the test site or Nellis Air Force Range?

Is a lot of it secret? Does the right hand know what the left hand is doing here??? Great! A possible vehicle launch or recovery accident from the VentureStar/Kistler project. All we need! This is a risk that should not be taken. There are unknowns here. This just gets worse and worse.

Response
Transportation casks arriving at the repository would be moved into the Waste Handling Building and the contents unloaded and stored in 50-foot-deep water pools inside the building. The Waste Handling Building would be made of concrete and this material would protect the waste stored in pools inside the building from external phenomena such as aircraft crashes. In the unlikely event that a space vehicle launched from the Nevada Test Site crashed into the Waste Handling Building, the impact from the crash would probably not exceed the impacts from the maximum seismic event considered in Appendix H of the EIS. This seismic event is assumed to cause a total collapse of the Waste Handling Building and damage all of the 294 fuel assemblies stored inside (DIRS 152579-Montague 2000). Therefore, DOE believes the impacts from highly unlikely events, such as the crash of a space vehicle, have been adequately considered (see Section H.2.1.5). As noted in Chapter 8 of the Final EIS, the Kistler activity described by the commenter is currently on hold.

10 (8500)
Comment - EIS000817 / 0163
P. 8-13. This Timbisha Shoshone Reservation creation possibility is of great interest. Why? Seems to me we probably owe it to them, right? For some broken treaty of the past? In any case, I'm all for it, but not if they get contaminated land. We are always "dumping" on Native Americans.

Response
The Department of the Interior has issued the *Final Legislative Environmental Impact Statement: Timbisha Shoshone Homeland* (DIRS 154121-DOI 2000). Chapter 8 of the repository EIS discusses the potential cumulative impacts of the proposed repository and the Timbisha Shoshone Homeland.

10 (8501)
Comment - EIS000817 / 0164
P. 8-14. Wow! And here you have gold and copper mining transport further complicating things. -- More traffic congestion and possible pollution.

Response
Section 8.4.2 of the EIS discusses the cumulative impacts from waste transport to the repository and other transportation activities in Nevada, including impacts from the Cortez Gold Mine. As discussed in that section, operation of the mine could have impacts on rail traffic and land use.

10 (8553)
Comment - EIS000817 / 0168
P. 8-78. Is American Ecology the one with all the controversy?

Response
As discussed in Section 8.3.2 of the EIS, American Ecology, through its subsidiary, U.S. Ecology, currently operates a hazardous waste treatment, storage, and disposal facility near Beatty, Nevada. The adjacent low-level radioactive waste disposal facility was closed in 1993 and is now under custody and control of the State of Nevada.

10 (8683)
Comment - EIS001816 / 0003
The existing radionuclide contamination from NTS [Nevada Test Site] testing is the closest, real world analogous, field laboratory for study by Yucca Mountain. YM [the Yucca Mountain Project] has done an exhaustive search in the literature and in the field to understand the geochemistry of radionuclides in groundwater like that of the NTS region. If the NTS UGTA [Underground Testing Area] program were to characterize the near-field area (plume) of groundwater contamination around a number of limited sites at Pahute Mesa, YM must evaluate the benefit to the DEIS analysis that a direct exchange of this type of information would provide, and how it would reduce major uncertainties in the cumulative hydrologic analysis section.

Response
Interactions with the Nevada Test Site Underground Test Area program have been an integral part of the ongoing multiyear effort to produce the combined Yucca Mountain/Nevada Test Site regional groundwater flow model of the Death Valley hydrologic system. Examples of data from the Underground Test Area program, which incorporates data gathered from the Pahute Mesa region and other areas, include results from tracer transport tests, water table elevations, water temperature measurements, hydrologic parameters, geologic data (structural and stratigraphic), hydrochemistry and isotopic data, evapotranspiration parameters, and colloid chemistry. The series of Underground Test Area boreholes in the Oasis Valley sub-basin are providing many types of basic hydrogeologic data on this important part of the Death Valley hydrologic system.

The incorporation of these various types of data refines the existing flow models and so reduces uncertainty in regional and site-scale groundwater flow processes and directions. The long-term performance analysis in Chapter 5 of the EIS benefits from the Underground Test Area data through the use of improved regional and site-scale flow models.

10 (8690)
Comment - EIS001816 / 0005
Section 8.3 Cumulative Long Term Impacts (page 8-76): the statement regarding the maximum potential dose from the underground testing inventory is calculated to be 0.2 millirem per year at 20 kilometers. Using the entire estimated source term, and a number of other assumptions about flow path processes for NTS [Nevada Test Site] water to migrate to a downgradient receptor for a dose of 0.2 millirem is a possible scenario. The YM [Yucca Mountain] DEIS must define how they intend to incorporate new information from the UGTA [Underground Testing Area] program about radionuclide migration in groundwater to adjust the cumulative dose at a downgradient receptor.

Response
The Department used the best available information to prepare the Draft EIS. Since issuing the Draft, DOE has revised some of the analyses of impacts associated with the Nevada Test Site. Section 8.3 now includes updated estimates of the potential dose from the underground testing.

The Yucca Mountain Project has a working relationship with the Nevada Test Site's Underground Test Area program to produce a regional groundwater flow model of the Death Valley hydrologic system. DOE will continue to foster this relationship to plan for future groundwater studies and groundwater monitoring. DOE continues to evaluate the extent of contamination from past underground testing and to refine the groundwater monitoring network based on the results of ongoing evaluations. As new information becomes available, DOE will use it to update impact estimates as appropriate.

10 (8695)
Comment - EIS001816 / 0007
Section 8.3 Cumulative Long Term Impacts (page 8-73): This section must include an analysis of the cumulative federal impact of siting a CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act of 1980] type (Superfund) site like YM [Yucca Mountain] down gradient of an existing Superfund-qualifying site like the NTS [Nevada Test Site] and particularly Pahute Mesa. The NTS Federal Facility Agreement and Consent Order (FFACO, 1996) was negotiated and signed to be a CERCLA-like cleanup agreement for the NTS. Although the NTS does more than qualify to be ranked as a CERCLA site, it was deliberately not put on the national priority list (NPL) CERCLA program. The YM DEIS should do an analysis of this federal action as it pertains to the cumulative impact of the repository program because it too someday will be a CERCLA site. After all, YM is basically a very sophisticated and highly engineered form of underground injection of waste. It too will qualify for the NPL in the years 3,000 or 12,000 or when who knows. Based on DOE modeling YM will contaminate at least one square mile of the subsurface.

Response
Chapter 8 of the EIS describes the cumulative impacts from the repository, along with past, present, and reasonably foreseeable future actions at the Nevada Test Site, Nellis Air Force Base, the Beatty low-level radioactive waste disposal site, and other non-Federal actions in the affected area (see Table 8-1). The cumulative impact assessment considered all past, present, and reasonably foreseeable activities on the Nevada Test Site rather than the Test Site's

regulatory classification. The fact that the Test Site has not been designated as a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) site was not a barrier to this cumulative impact assessment. Whether or not CERCLA standards would apply thousands of years in the future, and whether the Test Site would eventually be designated as a CERCLA site, would not affect the Department's assessment of potential cumulative impacts in the repository area.

10 (8699)
Comment - EIS001816 / 0009
Section 8.3 Cumulative Long Term Impacts (page 8-76): The utilization of computer modeling to predict groundwater velocities and radioactive transport is an approximation that cannot be validated. In fact, many parameters incorporated into the modeling of all systems eventually contributing to the groundwater source term and subsequent estimation of dose are sophisticated estimates. If the NTS UGTA [Nevada Test Site Underground Testing Area] program were to characterize contaminant plumes (near field) from underground testing within the aquifer, the DEIS must describe how valuable this information would be toward reducing many of the great uncertainties in the repository modeling program.

Response
DOE will continue to evaluate data gathered from the Underground Test Area program at the Nevada Test Site. As advances are made in characterizing contaminant plumes on the Test Site, the Yucca Mountain Project will use the results of these analyses to reduce the uncertainties of computer modeling associated with the long-term performance of the repository and cumulative impacts. Section 5.2.4 of the EIS discusses these uncertainties. It also discusses the possible effects that these uncertainties could have on the impacts estimated for the repository. The summary in Section 5.2.4 describes the assessment of repository performance as a "snapshot in time" that will be refined with additional work. DOE believes the performance assessment results reported in the EIS are conservative, and that additional work will increase confidence in these estimates.

10 (8724)
Comment - EIS002119 / 0009
There is also inadequate analysis of cumulative effects because of planned or present shipments of low-level waste, through waste to and from the NTS and present movement of hazardous material. There may be severe economic impacts within that context. The only cumulative effects we see, although there was some -- there's some lip service provided, is cumulative effects based upon this campaign only. However, we are operating in a context of a number of shipments and of a number of different materials.

Response
Section 8.4 of the EIS describes the cumulative impacts of past, present, and reasonably foreseeable shipments of radioactive materials throughout the Nation and through Nevada. Table 8-58 lists the collective worker-dose and general population dose (in person-rem), and traffic fatalities, from these actions from 1943 to 2047.

10 (8741)
Comment - EIS001816 / 0011
Section 8.3 Cumulative Long Term Impacts: Although the DOE estimates of groundwater basin perennial yield in the vicinity of YM [Yucca Mountain] far exceed the anticipated consumption from operation of the repository and usage in the Amargosa Valley, the DEIS must do further analysis to assess the cumulative impacts of possible increases in groundwater consumption in the next 50 years from: the Nevada Science, Technology, and Museum Corridor; NTS [Nevada Test Site] Development Corporation activities in Area 25; Interim Storage in Area 25; and water importation from Area 25; to augment the Las Vegas Valley Colorado River supply.

Response
Consistent with Council on Environmental Quality regulations (40 CFR 1508.7), DOE considered past, present, and reasonably foreseeable actions in its assessment of cumulative impacts and has reviewed a number of actions both current and proposed to determine relevance. The expression "reasonably foreseeable" refers to future actions for which there is reasonable expectation that the action could occur, such as a proposed action under analysis, a project that has already started, or a future action that has obligated funding. DOE believes that the analyses described in Chapter 8 adequately account for reasonably foreseeable future actions that could have a cumulative impact with the repository.

10 (8747)
Comment - EIS001816 / 0013
Section 3.1.13 (page 3-94) and Section 8.2.13 and 8.3.2.1.3 (page 8-77): Although E.O. [Executive Order] 12898 defines Environmental Justice with respect to minority populations of color and income only, the DEIS must go further and analyze the environmental justice or equity of operating and siting the YM [Yucca Mountain] repository in Southern Nevada where there is already substantial, existing radioactive contamination prior to what Yucca Mountain may bring to the region. The NTS [Nevada Test Site] is predicted to possibly dispose of 7.7 million cubic feet of low-level waste through 2070. In a cumulative impact analysis of these two major federal programs, YM appears to unfairly burden and stigmatize the southern Nevada region with additional radioactive source term material compared to other waste disposal sites. For the year 2050 it is recommended that the DEIS analyze the estimated, cumulative number of curies and nuclear waste volumes in Southern Nevada combined from all federal programs and discuss a broader concept of environmental justice.

Response
As discussed in Sections 8.2.13 and 8.4.12 of the EIS, environmental justice concerns would exist (1) if an activity would have significant environmental impacts and (2) if such impacts would have disproportionately high and adverse human health or environmental effects on minority or low-income populations. Analyses for the EIS indicated that there would be no significant impacts with regard to environmental justice.

An analysis of the cumulative number of curies and waste volumes, as suggested by the commenter, would not address the impact of the activity. DOE used the number of curies and waste volumes as input to the calculations, but not as a sole indicator of an effect. To estimate the impacts, the analysis accounted for the amount of radioactivity at the Nevada Test Site and the repository thousands of years into the future.

10 (8814)
Comment - EIS000869 / 0004
I am aware of the continuing possibility of nuclear contamination of air, land, table and surface water in and around the Nevada Test Site. There are also continuing questions as to land and earth fracture stability secondary to nuclear testing near existing fault lines.

Response
Section 8.3.2.1 of the EIS describes the activities on the Nevada Test Site that could contribute to cumulative impacts with the proposed repository. Since issuing the Draft EIS, DOE has revised some of the analyses of impacts associated with the Test Site. Sections 8.2.2.2 and 8.2.7 now include information on radiation exposure from past nuclear weapons testing, and Section 8.3 includes updated estimates of future impacts to groundwater and air resources from activities on the Test Site. There is no evidence that past testing of nuclear weapons at the Nevada Test Site has fractured the rock at Yucca Mountain or otherwise affected the stability of Yucca Mountain.

10 (8860)
Comment - EIS000869 / 0028
S.6, Cumulative Impacts of the Proposed Action, states that the "DOE could not reasonably predict future actions for the indefinite future. For that reason DOE did not attempt to estimate cumulative impacts beyond about 100 years...." I am not familiar with any person or agency that would have the ability to predict any future 10,000 years away. It is this extraordinary time period that is a major issue with all the alternatives presented in the Draft Environmental Impact Statement.

Response
The complete statement from Section S.6 of the EIS is, "DOE could not reasonably predict future actions for the indefinite future. For that reason DOE did not attempt to estimate cumulative impacts beyond about 100 years with the exception of impacts of radioactive materials reaching the groundwater or atmosphere and resulting in potential impacts to the public." DOE estimated cumulative impacts to groundwater for longer periods, including 1 million years in some cases (for example, see Table 8-48).

The projections included in the EIS are for the undisturbed case in which there is some ability to produce statistical projections of future ranges of climate patterns, geologic features and changes, behavior of engineered components, and other features, events, and processes. DOE made similar evaluations of long-term atmospheric impacts. The

most difficult problem with impact forecasts is predicting the future behavior of people and institutions, which is speculative. This is why the EIS analysis did not project many cumulative impacts beyond 100 years.

DOE acknowledges that 10,000 years (and even more so, 1 million years) is an extraordinary period over which to predict the behavior of the system. However, it is possible in many cases to describe this behavior in a way to determine with reasonable assurance that the repository would meet applicable regulatory standards set by Federal agencies (that is, the Nuclear Regulatory Commission and the Environmental Protection Agency). DOE and the Nuclear Regulatory Commission would apply these regulatory standards to judge the adequacy of the predicted behavior of the system. Environmental Protection Agency standards (40 CFR Part 197) require the analysis for the 10,000-year period and, in some cases (for example, the requirement to Caliente Peak dose and assess during the refining period of geologic stability), for considerably longer (1 million years).

10 (8862)
Comment - EIS000869 / 0029
S.6.1., Occupational and Public Health and Safety. Radiological Impacts to Workers compares fatalities under Module 1 or 2 to fatalities under the Proposed Action. There is not a timeframe mentioned in this paragraph. Considering that the previous paragraph has half the deaths mentioned in paragraph two, occurring in the first 100 years of repository operations, I am led to assume that the second paragraph is addressing the first 200 years. The Long-Term Radiological Impacts to public health occur from radionuclides ultimately from Yucca Mountain, past weapons testing on the Nevada Test Site, and past, present, and future disposal of radioactive waste on the Nevada Test Site and near Beatty, Nevada. The cumulative impacts from radionuclides released to groundwater are estimated at less than about 0.003 latent cancer fatality over 10,000 years. Again, I must assume that this is an ideal scenario without earthquakes, flooding, heavy rains, or other natural disasters which have been known to occur in this area. It also does not address nonfatal radiological effects. Radionuclides released to the air, land, dust, or other exposures are not addressed as long-term radiological impacts. Perhaps this was an oversight or perhaps it was intentionally omitted. It is an aspect that required due diligence as the down-winders in Southern Utah can attest.

Response
The EIS analyses assumed that the timeframe is 100 years, the expected period the repository would remain open. The "previous paragraph" referred to in the comment refers to impacts to workers from industrial (that is, non-nuclear) hazards and is unrelated to the paragraph on radiological impacts to workers.

10 (8864)
Comment - EIS000869 / 0030
S.6.3, Transportation, estimates implementation of the Proposed Action, and transportation of radioactive nuclear materials to result in 310-354 latent cancer fatalities. This emplacement period is an approximate 25-year time span. So this is estimating over 12 latent cancer fatalities, to worker and the public populations, per year just from transportation of radioactive nuclear materials. This is an unbelievably high number just from transportation and it is unrealistic to assume that the storage would result in less injuries, deaths, and latent cancer fatalities.

Response
The 310 to 354 latent cancer fatalities cited in the comment is a highly conservative estimate of the cumulative impact of all past, present, and reasonably foreseeable nationwide transport of all types of radioactive materials over a period of 90 years. This category includes shipments of radiopharmaceuticals for nuclear medicine and shipments of low-level radioactive waste to commercial disposal facilities. As shown in Table 8-58 of the EIS, the Proposed Action represents less than 5 percent of the total estimated cumulative impact. Section 8.2.7 of the EIS shows that the cumulative impacts from the operation and monitoring phase would be no greater than those from transportation, and the long-term impacts shown in Section 8.3.2.1.1 for the repository would be lower still.

10 (8881)
Comment - EIS001834 / 0022
A major flaw of the DEIS is that readers cannot determine their total risk in regard to the Yucca Mountain Project. The DEIS's lack of clarity and disjointedness make it difficult if not impossible to see how more than one risk factor could combine in order to get a picture of the total risk. The DEIS should provide some way for readers to determine "personal cumulative risk."

Response
As part of its analysis of Proposed Action impacts, the Department attempted to quantify, where possible, the total radiation dose that local residents could have received. The Department calculated the total risk to the population based on the assumption that radiation risks from different exposures are additive. However, the Department cannot in this analysis account for each individual resident's past radiation exposure. To do so would require accounting for lifestyle habits such as the frequency of airline flights, past residence in locations that receive substantially higher or lower cosmic radiation, the type and frequency of medical diagnostic tests and treatments, and a myriad of other factors. Therefore, the Department provided an estimate of the exposure of affected individuals in Chapter 4. Then the Department identified those actions that are imminent or reasonably foreseeable to add to the estimates from Chapter 4 to determine the overall cumulative impact estimates.

10 (8889)
Comment - EIS001834 / 0030
The DEIS does not adequately address the cumulative impacts associated with a nuclear waste repository at Yucca Mountain combined with the past, present, and future activities in the region, such as the Nevada Test Site [NTS], Nellis Air Force Range, and Beatty Low Level Waste Dump.

For example, the groundwater is already contaminated at the Nevada Test Site, and the aquifer that flows beneath the NTS is the same aquifer that is beneath Yucca Mountain. Therefore, contamination from Yucca Mountain would add to an already existing problem and make matters worse for the environment and the people who are dependent upon that aquifer for drinking, farming, and washing. Further, if current trends continue, a significantly higher number of people will be dependent upon that aquifer for water in the future. This increased population coupled with the cumulative effects of radioactive contamination would lead to higher doses and more cancer for the people in the Yucca Mountain and Amargosa Valley area.

Also, the above named sites also have effects on the desert environment, and these impacts must be considered in conjunction with the impacts that a nuclear dump at Yucca Mountain would add.

Finally, as the Nuclear Regulatory Commission has noted, the cumulative effects of water usage, land use, and biological resources. We request that the DOE calculate these cumulative effects and factor them into the DEIS. In order to ensure that all of these considerations are included, the DOE should rewrite the Cumulative Impacts section to more clearly and accurately characterize the total impacts from all of the environmental disaster areas in the Yucca Mountain regional area.

Response
Chapter 8 of the EIS analyzes a range of past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts. In preparing this chapter, DOE reviewed many documents to determine where there was potential for cumulative impacts. These documents included resource plans, EISs, environmental assessments, tribal meeting records, and other documents prepared by Federal, state, local, and private organizations.

Since publication of the Draft EIS, new information on cumulative impacts has become available. DOE has made every effort to include this new information in the Final EIS. For example, Sections 8.3.2.1 and 8.3.2.2 of the Final EIS contain a more complete assessment of the potential dose from past underground weapons testing and low-level radioactive waste disposal inventories on the Test Site. These new assessments used updated data from the Test Site and revised population projections. This information was then used to reexamine cumulative impacts to future populations who could reside in the Amargosa Desert.

Based on its method of analysis, the Department believes that it has accounted for those actions that would cumulatively affect Nye County and surrounding areas and has addressed those areas of impacts cited by the commenter. However, in response to this and other comments, the Department has revised the discussion in Chapter 8 to better present its methodology in estimating potential cumulative impacts.

Chapter 8 discusses cumulative impacts to land use, water resources, cultural resources, biological resources, socioeconomics, and environmental justice. The Department has revised some of the analyses since publication of the Draft EIS and believes that the Final EIS presents a reasonable estimate of the cumulative impacts to the region.

Finally, the Department acknowledges that Chapter 8 of the Draft EIS could have been clearer. Therefore, the Department has revised Chapter 8 to include summary sections that clearly indicate the contribution (or lack thereof) of each activity to cumulative impacts.

10 (8906)
Comment - EIS000869 / 0033
Groundwater contamination has already occurred at the Nevada Test Site and is reaching the borders of the Test Site. It is possible that it may have already contaminated groundwater in Beatty, Western Shoshone land, and in smaller communities surrounding the Nevada Test Site. It needs to be kept from progressing and the contaminated areas from becoming larger.

Response
The quality of the groundwater in the saturated zone at Yucca Mountain is described at the end of Section 3.1.4.2.2 of the EIS. Water samples from wells in the area exceeded the secondary standard for fluoride, as well as a proposed standard for radon. Fluoride and radon occur naturally in the rock through which the groundwater flows. Overall, groundwater quality at Yucca Mountain is good. There is no evidence that activities on the Nevada Test Site have contaminated the groundwater beneath Yucca Mountain. The last paragraph of Section 3.1.4.2.2 describes the results of groundwater monitoring at the Nevada Test Site and the nature and extent of contaminant migration.

Section 8.2.3.2 addresses cumulative short-term impacts on groundwater including those that could be additive to the Proposed Action from other Federal and non-Federal actions. These impacts relate primarily to water consumption and the resultant impacts on the availability of water resources in the area. Section 8.3 discusses cumulative long-term impacts including contaminant migration, and Sections 8.3.2.1 and 8.3.2.2 address cumulative impacts from activities on the Nevada Test Site and the Beatty low-level radioactive waste site, respectively.

DOE recognizes that some radionuclides or potentially toxic chemicals would eventually enter the environment outside the repository. The regional flow model prepared by the U.S. Geological Survey (DIRS 100131-D'Agnese et al. 1997) suggests that some of the water from the Nevada Test Site flows to the south toward the Amargosa Valley in the vicinity of Yucca Mountain, but the actual transport times and groundwater pathways from radionuclide contaminants on the Test Site are not clear at this time. Section 8.3.2.1.1 contains a qualitative calculation of the cumulative radiological impact from the Test Site and Yucca Mountain. As indicated, the potential cumulative peak dose for 10,000 years would be well below the regulatory limits established by the Environmental Protection Agency in 40 CFR Part 197. This combined peak dose would occur only in the unlikely event that the peak concentrations from the Nevada Test Site and Yucca Mountain occurred at the same time and at the same location.

10 (9353)
Comment - EIS001888 / 0066
Cumulative [impacts] throughout the DEIS are not readily identified given that the procedures used to define impacts are not sufficiently sensitive to isolate impacts among subgroups. With the methodologies available today to analyze data, and given the unprecedented nature of DOE's proposal to ship large volumes of nuclear waste across the nation, it is reasonable to expect DOE to analyze potential impacts at a variety of scales. Without such detail, neither Clark County nor communities along the transportation routes will be able to effectively assess impacts and design appropriate mitigation strategies. NEPA [National Environmental Policy Act] Regulation: Sec. 1502.14 Alternatives including the proposed action; Sec. 1502.16 Environmental consequences: Sec. 1502.22 Incomplete or unavailable information. Forty Most Asked Questions Concerning CEQs [the Council on Environmental Quality] NEPA Regulations. l9a. Mitigation Measures.

Response
The Department acknowledges at the beginning of Chapter 6 of the EIS that it is uncertain at this time when DOE would make any transportation-related decisions. The Department continues by saying it believes that the EIS provides the information necessary to make decisions regarding the basic approaches to waste transport (that is, mostly rail or mostly truck shipments), as well as the choice among alternative transportation corridors. DOE identified mostly rail in the Final EIS as its preferred mode of transportation both nationally and in the State of Nevada. DOE has not identified a preference among the five candidate rail corridors in Nevada. If the Yucca Mountain site was recommended and approved, DOE would issue, at some future date, a Record of Decision to

select a mode of transportation. Thereafter, for example, if mostly rail was selected (both nationally and in Nevada), DOE would then identify a preference for one of the rail corridors in consultation with affected stakeholders, particularly the State of Nevada. In this example, DOE would announce a preferred corridor in the *Federal Register* and other media. No sooner than 30 days after the announcement of a preference, DOE would publish its selection of a rail corridor in a Record of Decision. A similar process would occur in the event that DOE selected heavy-haul truck as its mode of transportation in the State of Nevada.

10 (9354)
Comment - EIS001888 / 0067
In Chapter 8, the DEIS has understated the scale and complexity of the cumulative impacts of DOE programs for the simultaneous disposal of low-level and high-level radioactive waste. According to DOE's Draft Waste Management Programmatic EIS* and later documents, the Nevada Test Site (NTS) is a preferred regional disposal site for low-level radioactive waste. This program will occur over a number of years, and would greatly increase the total number of truck shipments of radioactive waste through southern Nevada. Under present regulation, these shipments may be routed on the same highway system through Clark County as the shipments to a Yucca Mountain repository.

Despite assurances in the programmatic EIS, the Yucca Mountain DEIS did not contain an authoritative examination of the cumulative impacts of both DOE disposal programs on Nevada and Clark County. According to some estimates, the shipment of low-level radioactive waste from DOE defense sites across the nation to the NTS will last for approximately 70 years. The waste will be shipped by truck, conceivably through the most densely populated and sensitive parts of Clark County. The low-level radioactive waste (LLW) shipping campaign could result in the transport of up to 12 truckloads per day for more than 70 years.

*U.S. Department of Energy. *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-D, 1995.

Response
Section 8.4 of the EIS discusses the cumulative impacts of transportation in the region. This discussion includes the impacts of transporting low-level radioactive waste to the Nevada Test Site from offsite locations [the "Expanded Use Alternative" for the Nevada Test Site (DIRS 101811-DOE 1996)]. Table 8-58 shows that the radiological impacts of waste transport for the Proposed Action along with other past, present, and reasonably foreseeable shipments of radioactive material would be minor. To arrive at a conservative estimate of the collective radiation dose, the Department assumed that the same population of people (public and workers) would be exposed to each action that involved the transport of radioactive material.

The duration of shipments of low-level waste to the Nevada Test Site was assumed to be 10 years, based on Section E.7.2 of the Final Programmatic Waste Management EIS (DIRS 101816-DOE 1997). Routing details have not been determined. However, routing decisions would be in accordance with regulations of the U.S. Department of Transportation.

10 (9355)
Comment - EIS001888 / 0068
The DOE has already established a poor record for managing and transporting LLW [low-level radioactive waste] in Clark County. For example, after an incident with a LLW highway shipment from Ohio to the NTS that was found to be leaking non-radioactive water, the shipping campaign was suspended for over eighteen months as an internal investigation* was conducted. The two major findings were that DOE had not enforced its own requirements regarding the fabrication and deployment of the containers, and that institutional processes between and among DOE facilities, the State of Nevada, local governments and others had failed to provide effective control of this and similar situations.

Another example is regarding DOE's statements and subsequent efforts to minimize risk and impacts of LLW shipments on Clark County. In this case, representatives of DOE Nevada acknowledged that there are administrative means that may be used by DOE to assure that LLW shipments avoid high-risk areas. However, later inaction by DOE resulted in the continuation of shipments through the areas of concern in the Las Vegas Valley, except for truckers that voluntarily used other routes.

*U.S. Department of Energy Fernald Environmental Management Project. *Type B Accident Investigation Board Report of the December 15, 1997, Leakage of Waste Containers Near Kingman, Arizona*, February 1998.

Response
The incident to which the commenter refers occurred in December 1997 and involved the shipment of low-level waste from the Fernald Site in Ohio to the Nevada Test Site. The driver of the truck noticed that liquid was leaking from the container and followed the proper steps to notify local authorities and DOE. Subsequent investigation revealed that the liquid was not contaminated. Steps have been taken to prevent such an incident from occurring again. There was no harm to workers or the environment from the incident in question. With regard to Yucca Mountain, all waste (spent nuclear fuel and high-level radioactive waste) would be in solid form (that is, no liquid or other material that could leak).

With regard to shipping routes for specific shipments, the Department acknowledged in the Programmatic Waste Management EIS (DIRS 101802-DOE 1995) that "DOE proactively works with states, regional entities, and carriers during large shipping campaigns to ensure that safe routing alternatives and safe havens are utilized." However, the selection of any route will pose a risk to some portion of the public; the avoidance of one area would affect other areas through which the shipment was routed. Regulations by the U.S. Department of Transportation govern the routing of radioactive materials, and carriers are responsible to the U.S. Department of Transportation for routes that are used.

10 (9356)
Comment - EIS001888 / 0069
The DEIS analysis of cumulative impacts shows no consideration of the context in which spent nuclear fuel (SNF) will be transported to Yucca Mountain. There is also no information about other hazardous commodities on the roads and railways. There is no discussion of the substantial impacts of the DOE's LLW [low-level radioactive waste] disposal program on Clark County and the likely relationship between the LLW and SNF disposal programs.

The DEIS also does not present a description of the impacts of these programs on the infrastructure (e.g., highways, roadside facilities) of Clark County, nor does it provide sufficient information about the necessary emergency management requirements to respond to the DOE's programs. To rectify the substantial omissions in the DEIS, the DOE must prepare a supplemental evaluation of cumulative impacts that describes the current context in which SNF will be transported. This additional analysis must address the current hazardous materials shipments in urban Clark County and rural Nevada for both rail and truck modes, it must describe the process used to identify and measure cumulative impacts and it must measure those impacts.

Response
Section 8.4 of the EIS discusses the cumulative impacts from the transport of radioactive materials in the region. It includes the impacts of transporting waste to the Nevada Test Site under the Expanded Use Alternative (Alternative 3) described in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). This alternative includes shipments of low-level radioactive waste to the Test Site from offsite locations. Section 8.2.12.2 discusses the cumulative impacts of storing low-level waste, including the reasonably foreseeable action that the Nevada Test Site is selected as a regional DOE low-level waste disposal site. Impacts to people and the environment from shipments of nonradioactive hazardous materials on the Nation's roads and railways are not examined because such shipments are unrelated to the Proposed Action, which is to transport and dispose of radioactive materials at Yucca Mountain.

Section 8.4.1.2 and Table 8-58 of the EIS summarize cumulative transportation-related radiological impacts from the Proposed Action, Inventory Modules 1 and 2, and other Federal, non-Federal, and private actions nationwide. The table summarizes potential impacts from current Federal waste transport activities. These include shipments of low-level waste to the Nevada Test Site, shipments of transuranic waste to the Waste Isolation Pilot Plant in New Mexico, and shipments of spent nuclear fuel and high-level radioactive waste to various storage and disposal sites throughout the Nation. DOE believes that these impacts would be minor.

10 (9357)
Comment - EIS001888 / 0070
In the paragraph below, citations are provided from the DEIS regarding its analysis of cumulative impacts on cultural resources and socioeconomic conditions. These are included to demonstrate that, in non-compliance with NEPA [National Environmental Policy Act] Regulation, Section 1502.22, DOE has not provided sufficient detail to analyze potential cumulative impacts resulting from the proposed repository at Yucca Mountain. Because of this deficiency, the DEIS inadequately addressed potential mitigation needs.

DEIS Statement, p. 8-37: Cumulative Impacts on Cultural Resources. "...the emplacement of either module would require small additional disturbances to land in areas already surveyed during site characterization activities. Because repository construction, operation and monitoring, and closure would be Federal actions, DOE would identify and evaluate cultural resources, as required by Section 106 of the National Historic Preservation Act, and would take appropriate measures to avoid or mitigate adverse impacts to such resources. As a consequence, archaeological information gathered from artifact retrieval during land disturbance would contribute additional cultural resources information to the regional database for understanding past human occupation and use of the land. However, there would be a potential for illicit or incidental vandalism of archaeological or historic sites and artifacts as a result of increased activities in the repository area, which would be extended for Module 1 or 2, and this could contribute to an overall loss of regional cultural resources information.

"The Native American view of resource management and preservation is holistic in the definition of cultural resources, incorporating all elements of the natural and physical environment in an interrelated context (AIWS 1998, all). The Native American perspective on cultural resources is further discussed in Chapter 3, Section 3.1.6. Potential impacts resulting from the Proposed Action described in Chapter 4, Section 4.1.5, would also apply to Inventory Module 1 or 2."

DEIS Statement, p. 8-39: Cumulative Impacts on Socioeconomic Conditions. "The Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE 1996f, all) presents various scenarios for Nevada Test Site actions. The Record of Decision for that EIS states that DOE would implement a combination of three alternatives: Expanded Use, No Action (continue operations at current levels) regarding mixed and low-level radioactive waste management, and Alternate Use of Withdrawn Lands regarding public education (61 *FR* 65551, December 13, 1996). Under this combination of alternatives, the Nevada Test Site could generate an increase of approximately 4,550 direct jobs, and most of these workers would be likely to live in Clark County (Department of Energy 1996f, page 5-17)."

Response
DOE believes that the analytical approach used in Chapter 8 of the EIS to examine cumulative impacts is consistent with all applicable requirements including regulations implementing the National Environmental Policy Act promulgated by the Council on Environmental Quality, including 40 CFR 1502.22. Chapter 8 provides the appropriate amount of information for understanding cumulative impacts that could be associated with a repository at Yucca Mountain, including cumulative impacts to cultural resources and socioeconomic conditions. In addition, the Department believes that the mitigation measures described in Chapter 9 are responsive to the potential impacts from the repository identified by the analysis (see Section 9.2.4).

In general, the analysis of cumulative impacts in Chapter 8 followed the process recommended in the Council on Environmental Quality's handbook *Considering Cumulative Effects Under the National Environmental Policy Act* (DIRS 103162-CEQ 1997). This process included the identification, through research and consultations, of Federal, non-Federal, and private actions with possible effects that would be coincident with those of the Proposed Action on resources, ecosystems, and human communities.

10 (9467)
Comment - EIS001888 / 0138
Further, if DOE is planning to piggyback rail shipments, then the cumulative impacts from this activity should be identified in the DEIS.

Response
In the Final EIS, DOE identifies mostly rail as its preferred mode of transportation both nationally and in the State of Nevada. Possible sharing of a branch rail line is speculative at this time. Therefore, analyzing the cumulative impacts of shared use at a rail line could result in a misrepresentation of those impacts.

10 (9485)
Comment - EIS001888 / 0150
[Summary of comments noted by Clark County Nuclear Waste Divisions staff at various citizens' meetings.]

Concern that DOE is not taking into account that Nevada is already impacted by the Low-Level Waste shipments that are going to NTS [Nevada Test Site] and the continuing effects of the nuclear tests that were performed there.

Concern that DOE is not considering all the impacts Southern Nevada has already received from operations at the NTS.

Response
Table 8-58 of the EIS summarizes cumulative transportation-related radiological impacts from the Proposed Action, Inventory Modules 1 and 2, and other Federal, non-Federal, and private actions nationwide. The table considers potential impacts from current Federal waste-transport activities. These include shipments of low-level waste to the Nevada Test Site, shipments of transuranic waste to the Waste Isolation Pilot Project in New Mexico, and shipments of spent nuclear fuel and high-level radioactive waste to various storage and disposal sites throughout the nation from 1943 to 2047.

Impacts from operation of the Nevada Test Site are described in Section 8.2.7 of the EIS. Future impacts to groundwater from past weapons testing are described in Section 8.3.2.1.1. Section 3.1.8 of the Final EIS discusses estimates of radiation doses to individuals from past weapons testing on the Nevada Test Site. This information has been included in Sections 8.2.2.2.2 and 8.2.7 as contributing to short-term cumulative radiological impacts. Readers interested in further information about the effects of past testing of nuclear weapons should refer to the *National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans From Nevada Atmospheric Nuclear Bomb Tests* (DIRS 152469-Institute of Medicine and National Research Council 1999).

10 (9660)
Comment - EIS001888 / 0319
The cumulative effects portion of the DEIS understates the scale and complexity of the cumulative impacts of the DOE's waste disposal program. Despite assurances in the Waste Management Programmatic Environmental Impact Statement, the DEIS does not contain an authoritative examination of the cumulative impacts of both DOE disposal programs on Nevada and Clark County. According to some estimates, the shipment of Low Level Radioactive Waste [LLW] from DOE defense [sites] across the nation to the Nevada test Site will last for approximately 70 years. The waste will be shipped by truck, and may be shipped through the most densely populated and sensitive parts of Clark County. The LLW shipping campaign will require up 12 trucks per day for the entire 70 years of the program. The chart in Figure 11 depicts the recent LLW shipments through Clark County to the Nevada Test Site.

Response
Section 8.4 of the EIS describes the cumulative impacts of past, present, and reasonably foreseeable shipments of radioactive materials throughout the nation and in Nevada. Table 8-58 lists the collective worker dose and general population dose (in person-rem), and traffic fatalities, from these actions between 1943 and 2047.

10 (9663)
Comment - EIS001888 / 0321
The DEIS provides no information about the context in which SNF [spent nuclear fuel] will be transported. There is no information about other hazardous commodities on the roads and railways. There is no discussion of the substantial impacts of the DOE's LLW [low-level radioactive waste] disposal program on Clark County and the likely relationship between the LLW and SNF disposal programs.

To rectify the substantial omissions in the DEIS, the DOE prepare a supplemental statement of cumulative impacts that describes the current context in which SNF will be transported. This additional statement must address: the

current hazardous materials shipments in urban Clark County and rural Nevada for both rail and truck modes, it must describe the process used to identify and measure cumulative impacts and it must measure those impacts.

Response
Section 8.4 of the EIS discusses the cumulative impacts from the transport of radioactive materials in the region (see Appendix M). It includes the impacts of transporting waste to the Nevada Test Site under the Expanded Use Alternative (Alternative 3) described in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996). This alternative includes shipments of low-level radioactive waste to the Test Site from offsite locations. Section 8.2.12.2 discusses the cumulative impacts of storing low-level waste, including the reasonably foreseeable action that the Nevada Test Site is selected as a regional DOE low-level waste disposal site. Impacts to people and the environment from shipments of nonradioactive hazardous materials on the nation's roads and railways are not examined because such shipments are unrelated to the Proposed Action, which is to transport and dispose of radioactive materials at Yucca Mountain.

Section 8.4.1.2 and Table 8-58 of the EIS summarize cumulative transportation-related radiological impacts from the Proposed Action, Inventory Modules 1 and 2, and other Federal, non-Federal, and private actions nationwide. The table summarizes potential impacts from current Federal waste transport activities. These include shipments of low-level waste to the Nevada Test Site, shipments of transuranic waste to the Waste Isolation Pilot Project in New Mexico, and shipments of spent nuclear fuel and high-level radioactive waste to various storage and disposal sites throughout the nation. DOE believes that the impacts from these shipments has been and will continue to be minor.

10 (9716)
Comment - EIS002151 / 0006
The most serious environmental disaster in the project is the soil and groundwater from nuclear testing. That deadly soil and water is moving off the Nevada Test Site. It doesn't stay contained on the test site. That's something that the workers have even talked about, the scientists have talked about, Corbin Harney has talked about, the Western Shoshone National Council has talked about, so it's important that we listen to that. The U.S. Government has already proven they will contaminate the land over a thousand times. We believe that test site has had over a thousand bombs. It's not even under a thousand.

Response
DOE describes the effects of weapons testing at the Nevada Test Site in Section 8.3.2 of the EIS.

10 (9740)
Comment - EIS001888 / 0324
[Clark County summary of comments it has received from the public.]

Requests for a review of the effects of past DOE (and predecessor) activities in Southern Nevada have not been addressed in the DEIS.

Response
Section 8.3.2.1 of the EIS describes the activities on the Nevada Test Site that could contribute to cumulative impacts with the proposed repository. Since issuing the Draft EIS, DOE has revised some of the analyses of impacts associated with the Nevada Test Site. Sections 8.2.2.2 and 8.2.7 now include information on radiation exposure from past nuclear weapons testing, and Section 8.3 now includes updated estimates of future impacts to groundwater and air resources from activities on the Nevada Test Site. Section 8.4 discusses the cumulative impacts of transportation in the region, including impacts from the Expanded Use Alternative (Alternative 3) described in the Nevada Test Site EIS (DIRS 101811-DOE 1996). This alternative includes the shipment of low-level radioactive waste to the Nevada Test Site from offsite locations. Section 8.2.12.2 of this EIS discusses the cumulative impacts from storing low-level waste, including the reasonably foreseeable action of the Test Site as a regional DOE low-level waste disposal site.

10 (9749)
Comment - EIS001888 / 0333
[Clark County summary of comments it has received from the public.]

Commenters expected the EIS to analyze the cumulative environmental and radiological risks and hazards from all past, current and proposed radioactive waste and special nuclear materials activities at Yucca Mountain, the NTS [Nevada Test Site], and surrounding environs. Commenters identified commercial and DOE-owned SNF [spent nuclear fuel], foreign research reactor SNF, HLW [high-level radioactive waste], Greater than Class C waste, special case waste, LLW [low-level radioactive waste], TRU [transuranic] waste, and special nuclear materials that should be included in these analyses. These analyses are also expected to consider transportation (all communities and Indian Nations, all routes, all modes, all rail spurs storage and/or disposal, and treatment. More specifically, commenters requested that the EIS address: (1) both the 70,000 MTHM [metric tons of heavy metal] limit and the total estimated 85,000 MTHM of SNF, (2) all DOE-owned SNF, (3) all foreign research reactor SNF (~19.2 MTHM), (4) ~28,372 canisters of HLW (to be modified to reflect decisions from Hanford's tank waste EIS), (5) ~70,000 cubic feet of Greater than Class C, and (6) ~2.6 million cubic feet of special case waste. Commenters requested that the cumulative impact analyses assess the significance of direct and indirect long-term effects on the human and natural environment, such as impacts to human health (to "downwinders," local communities, and workers), ecosystems (with reliance on the NTS resource management plan), air quality, soils, socioeconomics, and local and regional groundwater resources. Impacts should be developed in consideration of: (1) contaminant levels from past weapons testing and associated research and development activities at NTS, (2) waste disposed of or planned for disposal at the NTS, (3) waste disposed of at the Beatty low-level waste site, (4) ongoing waste management, environmental restoration, and decontamination and decommissioning activities at NTS, (5) military operations, and (6) discharge of toxic metals from abandoned mines. Cumulative impacts must be assessed in time frames that range from 1,000 to 1,000,000 years. Commenters requested that the cumulative impact analyses be supported by credible scientific data, including the development of baseline health data, which have undergone peer review. In addition, the way in which equity and fairness issues are involved should be considered.

Response
The Department believes that the Draft EIS adequately analyzed the cumulative environmental and radiological impacts of the repository. As shown in Figure 8-1 and Appendix A, the EIS analyzed several categories of nuclear materials to be placed in the repository, as follows: up to 105,000 metric tons of heavy metal of commercial and DOE spent nuclear fuel, including foreign research reactor fuel in the 15 categories of fuel analyzed (see Table A-16); over 22,000 canisters of high-level radioactive waste using the calculation method described in Appendix A; about 2,000 cubic meters (70,000 cubic feet) of Greater-than-Class-C waste; and about 4,000 cubic meters (140,000 cubic feet) of Special-Performance-Assessment-Required waste. These materials represent the currently proposed and reasonably foreseeable inventories that could be placed in the repository.

In relation to the impact assessment, Chapter 8 of the Final EIS discusses the short- and long-term cumulative effects on human health (Sections 8.2.7, 8.3.1.2, 8.3.2, 8.2.8, and 8.4.2.7); ecosystems (Sections 8.2.4 and 8.4.2.4); air quality (Sections 8.2.2, 8.3.1.2.3, 8.3.1.3.3, and 8.4.2.2); soils (Sections 8.2.4 and 8.4.4); socioeconomics (Sections 8.2.6 and 8.4.2.6); and local and regional groundwater (Sections 8.2.3, 8.3.1.2.1, and 8.4.2.3).

In the analyses described in the sections cited above, the Department considered past weapons testing and waste management activities at the Nevada Test Site (Sections 8.3.2.1.1 and 8.3.2.1.3), as well as activities at the Beatty low-level radioactive waste disposal facility (Section 8.3.2.2). The analysis did not include environmental restoration and decontamination and decommissioning activities at the Nevada Test Site. However, DOE updated Table 8-58 of the EIS to include analysis of the Expanded Use Alternative from the Nevada Test Site EIS (DIRS 101811-DOE 1996).

The Department did not include an analysis of the discharge of metals from abandoned mines for several reasons. First, older abandoned mines have been present in the area for decades, and the Department believes the impacts are captured in the baseline information discussed in Chapter 3. Second, any discharges would not result in a short-term cumulative impact with the Proposed Action because the repository would have no waterborne releases for at least 10,000 years. Third, long-term impacts of the mines are speculative because of continuing efforts to clean up the abandoned mines. This issue is being addressed not only by the State of Nevada but also by the U.S. Congress. In March 2000, Congressman Jim Gibbons (Nevada) introduced House Resolution 2753, Abandoned Mine Restoration

Act of 1999. This legislation, and other similar legislation, could provide the means to restore the environment of mines, removing any toxic metals that could cause further harm to the environment in the future. The number of mines that would be included in this effort is still unknown, as are the cleanup criteria that might be applied.

10 (9752)
Comment - EIS001888 / 0335
[Clark County summary of comments it has received from the public.]

Several commenters requested that the EIS reveal and otherwise evaluate the effect of past DOE activities in southern Nevada. More specifically, commenters requested (1) a history of decisions by DOE (and DOE-predecessors the Energy Research and Development Administration and the Atomic Energy Commission) that have affected the health and safety of organisms within a 700-mile radius of Yucca Mountain, (2) a summary of Research conducted on the effects on health and safety from radiation exposure, (3) a list and summary of past and pending litigation on radiation exposure, (4) that the EIS examine the global risks from nuclear-related activities, and environmental restoration and waste management at the NTS [Nevada Test Site], including the transportation of wastes, and (5) that the repository EIS be coordinated with the EIS on the NTS.

Response
In response to item 1 of the comment, Chapter 8 of the EIS describes the cumulative impacts from the repository, along with past, present, and reasonably foreseeable future actions at the Nevada Test Site, Nellis Air Force Base, the Beatty low-level radioactive waste disposal site, and other non-Federal actions in the affected area (see Table 8-1). With the exception of some factual changes and clarifications in the Final EIS, DOE believes that the Draft EIS adequately characterized the cumulative impacts associated with the proposed repository, which includes activities at the Nevada Test Site.

In relation to item 2, the effects of radiation on health and safety have been studied extensively over the past century and are better known than those of most toxins. Our current knowledge about the health effects of radiation is based in large part on exposures of individuals to large doses of radiation that exceed any U.S. public or worker dose limit. Appendix F of the EIS contains more information about the current state of knowledge about the health effects of radiation.

In response to item 3 of the comment, DOE did not include a summary of past and pending litigation on radiation exposure because this information would not aid decisionmakers to evaluate the potential impacts of the repository. Worker protection and the long-term performance of the repository are governed by established radiation protection standards. It is against these standards that the radiological impacts of the repository will be judged.

In relation to item 4, the EIS did not report potential global impacts to environmental "commons," such as surface waters, because there would be no release of radioactive material to major rivers, and thus no releases to the oceans. As stated by the National Academy of Sciences (DIRS 100018-National Research Council 1995), "…the most likely pathway for global distribution are gaseous releases of carbon dioxide containing the radioactive isotope of carbon-14, that eventually will escape from the waste containers, or by widespread distribution of foodstuffs grown with contaminated water." However, the National Academy of Sciences also stated, "In general, the risks of radiation produced by such wide dispersion are likely to be several orders of magnitude below those to a critical group." For example, the Academy estimated that the average dose to members of the global population, based on the release of 91,000 curies of carbon-14, to be 0.003 microsievert per year (0.0003 millirem per year). The Academy equated that to an annual risk of fatal cancer of 1.5 in 10 billion (1.5×10^{-10}). For comparison, the standard set by the Environmental Protection Agency in 40 CFR Part 197 of 15 millirem per year for the reasonably maximally exposed individual is a factor of 50,000 times higher.

Because of large uncertainties, the Department considers estimates of global health effects highly speculative and, therefore, did not estimate global collective doses or health effects in the EIS. However, the Department agrees with the Environmental Protection Agency (64 *FR* 46976, August 27, 1999) and the National Council on Radiation Protection and Measurements (DIRS 101858-NCRP 1995) that, for purposes of optimizing protectiveness of design alternatives, estimation of population doses is merited. However, the Department believes that information important to design optimization can be obtained by estimating collective dose to the regional populations within 80 kilometers [50 miles] of the repository, thereby precluding the need to perform the more speculative, global

health risk calculations. For these reasons, the EIS evaluated in detail potential radiological exposures to the reasonably maximally exposed individual and regional populations (80 kilometers) from both groundwater and atmospheric pathways. Sections 5.4 and 5.5 present the results of these evaluations for waterborne and atmospheric releases, respectively.

In relation to item 5 of the comment, the repository EIS is consistent with information and analyses in the Nevada Test Site EIS (DIRS 101811-DOE 1996). As indicated in Section 8.3.2.1.1 of the repository EIS, the Nevada Test Site EIS was used as a source of information for cumulative long-term impacts. Furthermore, the Nevada Test Site EIS was a source document for the transportation impacts described in Section 8.4.1.2 of the repository EIS. In addition, representatives of the Yucca Mountain Project and the Nevada Test Site continue to maintain an open dialogue to ensure that decisions made at either facility support the common goals of both facilities and protect the environment and the health and safety of workers and the public.

10 (9887)
Comment - EIS001888 / 0435
In general, the EIS should estimate the "long-term cumulative impacts to the environment and therefore to humans."

Response
Chapter 8 describes the cumulative long-term impacts of the repository, along with the impacts of past, present, and reasonably foreseeable activities in the affected region. Geologic and hydrologic studies and computer modeling conducted by DOE, the U.S. Geological Survey, and other organizations indicate that the repository would perform in compliance with 40 CFR Part 197.

10 (10006)
Comment - EIS001888 / 0502
[Clark County summary of comments it has received from the public.]

Cumulative impacts are not being adequately measured.

Response
Chapter 8 of the EIS describes the cumulative impacts from a repository at Yucca Mountain, along with past, present, and reasonably foreseeable future actions at the Nevada Test Site, Nellis Air Force Base, the Beatty low-level radioactive waste disposal site, and other non-Federal actions in the affected area (see Table 8-1). In preparing Chapter 8, DOE reviewed many documents to determine the potential for cumulative impacts. These documents included resource management plans, EISs, environmental assessments, and records of tribal meetings prepared by Federal, state, local, and private organizations. DOE believes that the EIS adequately characterizes the cumulative impacts associated with the proposed repository.

10 (10259)
Comment - EIS002216 / 0001
Well, I'd like to pose the question about the existing contamination, the ongoing low-level waste disposal and the existing contamination that's at the Nevada Test Site [NTS] right now, especially those of you folks that are in Amargosa.

We don't have a monitoring network out there for you folks yet. We don't know where the source term is going. It's not protected by engineered barrier.

So this is more directed toward people who are working on the Yucca Mountain Project because with the advisory board and the existing citizen interest, we don't address the existing contamination very well at all, and that program is moving forward without much public scrutiny, with a lack of oversight.

The governor's requested 40 million more dollars to throw at the program, and like Yucca Mountain, you just don't just solve a problem by throwing more money at it.

You've got to have some oversight, some technical strategy. You've got to have a plan.

The NTS is on the stage of becoming the nation's premier low-level waste disposal facility, and there's not much the State of Nevada can do to stop that.

And the existing contamination has been in the groundwater for years and we don't know the extent or the duration and the magnitude of that contamination.

Response
As a result of monitoring concerns expressed by many commenters, DOE has supported Nye County in its program (called the *Early Warning Drilling Program*) to characterize further the saturated zone along possible groundwater pathways from Yucca Mountain as well as the relationships among the volcanic, alluvial, and carbonate aquifers. Information from the ongoing site characterization program (and possible Testing and Performance Confirmation Program, which is described below) would be used in conjunction with that of the Early Warning Drilling Program to refine the Department's understanding of the flow and transport mechanics of the saturated alluvium and valley-fill material south of the proposed repository site, and to update conceptual and numerical models used to estimate waste isolation performance of the repository. When DOE published the Draft EIS, only limited information from the Early Warning Drilling Program was available. Since then, however, this program has gathered additional information, which DOE has incorporated in the EIS.

In addition, DOE has installed a series of test wells along the groundwater flow path between the Yucca Mountain site and the Town of Amargosa Valley as part of an alluvial testing complex. The objective of this program is to better characterize the alluvial deposits beneath Fortymile Wash along the east side of Yucca Mountain. Single- and multiwell tracer tests have begun and the results thus far have strengthened the basis of the site-scale saturated flow and transport model. Information from this program has been incorporated in the EIS.

If the site was approved, DOE would institute a Testing and Performance Confirmation program, elements of which would address the hydrologic system. The purpose of this program would be to further evaluate the accuracy and adequacy of the information used to determine whether the repository would meet long-term performance objectives. The Testing and Performance Confirmation program, which would continue through closure of the repository (possibly as long as 300 years), would offer a means to further understanding of the hydrologic system and reduce uncertainties.

10 (10691)
Comment - EIS002141 / 0002
It is almost absurd that an Environmental Impact Statement is being done for the Nevada Test Site when you consider that there are almost 1,000 repositories already there. I understand that you have to prepare [an] Environmental Impact Statement, but the truth is the nuclear weapons program has already created all of those repositories.

The Environmental Impact Statement should consider the environmental impact of Yucca Mountain in the context of the fact that these repositories are already there. The additional impact of a well designed, highly controlled repository will be zero and the Environmental Impact Statement should reflect that.

Response
The Draft EIS contained results of a cumulative groundwater impact analysis which included potential impacts from past weapons testing and low-level radioactive waste disposal at the Nevada Test Site. However, for the Final EIS, DOE completed additional, more detailed analyses based on the most recent data available. Section 8.3.2.1.1 contains the results.

10 (10878)
Comment - EIS000053 / 0001
The Military Lands Withdrawal Act of 1986 required the preparation of the Special Nevada Report. This report, finalized in September 1991, contains a description of current and proposed defense-related activities in the State of Nevada, an analysis of their impacts, and possible actions that could be taken to mitigate those impacts. The report was prepared jointly by the Departments of the Air Force, Navy, and Interior with the Department of Army and Department of Energy listed as cooperating agencies. Per Section 6(b)(1)(D) of The Act, the Special Nevada Report

was mandated to include the lands withdrawn or being considered for withdrawal for use by the Department of Energy.

With respect to water resources, a number of impacts were found to result from the cumulative land withdrawals including the lack of access to potentially developable water resources, water quality impairment resource

consumption by federal agencies, and resource competition with non-federal water users. Page 8-97 of the Special Nevada Report states that:

"The withdrawal of land from public access and/or the purchase of water rights by DOD and DOE has the greatest potential for effects on Nevada....The water resources associated with these lands could, if they exist and were available, play an important role in the continued growth of southern Nevada."

The Special Nevada Report is not referenced in the Draft EIS for Yucca Mountain nor are the direct, indirect, or cumulative impacts of federal land withdrawals and water use considered and evaluated. These impacts are significant. The failure of the Draft EIS for Yucca Mountain to incorporate the findings of the Special Nevada Report is a serious inadequacy in the document. The Draft EIS must be revised to include these findings of the Special Nevada Report and must include an evaluation of the cumulative consequences of the land withdrawal for the proposed repository at Yucca Mountain.

Response
DOE has revised Section 8.2 of the EIS to include a discussion of the *Special Nevada Report* (DIRS 153277-SAIC 1991). It should be noted, however, that the *Special Nevada Report* is more than 10 years old and many changes have occurred since the report was prepared. In its analysis of cumulative impacts in the Draft EIS, the Department was obligated to consider past, present, and reasonably foreseeable future actions based on the current understanding of these actions. For that reason, the *Special Nevada Report* was not referenced in the Draft EIS. Instead, the Department reviewed current resource plans prepared by Federal agencies, EISs and environmental assessments, tribal meeting records, and other documents representing Federal, State, local, and private organizations to determine past, present, and reasonably foreseeable actions that, combined with the proposed repository, could contribute to cumulative impacts. For example, recent National Environmental Policy Act documents for the Nevada Test Site and the Nevada Test and Training Range (formerly known as the Nellis Air Force Range) describe past, present, and future activities for those areas. DOE considered those activities in the cumulative impacts analyses in Chapter 8 of the EIS.

10 (11101)
Comment - EIS002135 / 0007
But in my written statement which I will present, I will attempt to show why the DEIS fails to adequately address the cumulative impacts of the entire nuclear chain for mining nuclear weapons and nuclear waste production, which I believe that this DEIS should show; not just Yucca Mountain, but it should show the cumulative impacts of the entire nuclear chain.

Response
Chapter 8 of the EIS discusses the impacts of the repository along with past, present, and reasonably foreseeable future actions that could be spatially and temporally related to impacts of the repository. Activities and impacts that are outside the affected area, including the mining of uranium, are not within the scope of the EIS.

For information about the impacts of mining uranium, see the Nuclear Regulatory Commission's analyses in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (DIRS 101899-NRC 1996).

10 (11178)
Comment - EIS000466 / 0010
The draft EIS does not consider cumulative impact.

Response
Chapter 8 of the EIS is devoted entirely to cumulative impacts.

10 (11407)
Comment - EIS002251 / 0005
The EIS is national in scope, but I think we have a world-wide problem here. We all know that radiation is spread throughout the world from numerous events from the Nevada Test Site. And I think that the DOE needs to consider the whole world in its comments on this, because the whole world and all animal life and plant life are being affected now as we see higher and higher rates of cancer and the declining species in this world.

Response
The repository EIS does not report global adverse impacts because such impacts would be negligible. As stated by the National Academy of Sciences "..the most likely pathway for global distribution are gaseous releases of carbon dioxide containing the radioactive isotope of carbon-14, that eventually will escape from the waste containers, or by widespread distribution of foodstuffs grown with contaminated water." However, the Academy stated, "In general, the risks of radiation produced by such wide dispersion are likely to be several orders of magnitude below those to a critical group." For example, the Academy estimated that the average dose to members of the global population, based on the release of 91,000 curies of carbon-14, is 0.0003 millirem per year, and equated that to an annual risk of fatal cancer of 1.5 in 10 billion (DIRS 100018-National Research Council 1995). For comparison, the individual dose standard set by the Environmental Protection Agency in 40 CFR Part 197 of 15 millirem per year for the maximally exposed individual is 50,000 times that dose.

Because of large uncertainties, DOE considers estimates of global health effects to be highly speculative and, therefore, did not estimate global collective doses or health effects in the EIS. However, DOE agrees with the Environmental Protection Agency (64 *FR* 46976, August 27, 1999) and the National Council on Radiation Protection and Measurements (DIRS 101858-NCRP 1995, Report 121) that optimizing the protectiveness of design alternatives merits the estimation of population doses. The Department believes it can obtain information important to design optimization by estimating collective dose to the regional populations within 80 kilometers (50 miles) of the repository, thereby precluding the need to perform the more speculative global health risk calculations. For these reasons, the EIS evaluated in detail potential radiological exposures to the maximally exposed individual and regional populations (80 kilometers) from both groundwater and atmospheric pathways. Sections 5.4 and 5.5 of the EIS describe the results of these evaluations for waterborne and atmospheric releases, respectively.

10 (11490)
Comment - EIS002254 / 0003
What will it take to stop ongoing contamination?

Response
Assuming the commenter's reference to "ongoing contamination" means the Nevada Test Site, DOE is conducting widespread monitoring and remediation of selected sites that were contaminated by past activities on the Nevada Test Site. With regard to the repository, the NWPA requires DOE to study Yucca Mountain to determine its suitability for use as a repository, and to prepare an EIS that describes the impacts of such a repository. Modeling of the long-term performance of the repository shows that the combination of natural and engineered barriers at the site would keep releases below the limits established for the repository by the Environmental Protection Agency in 40 CFR Part 197.

10 (11505)
Comment - EIS002137 / 0006
Alternate routes. I'll give you an alternate route: To Carlin, the railroad system. Out of the -- out of the county called Clark right through the geographical center of the State of Nevada. Once the waste is hauled, what do we have? We have a railroad system for the economic development and issues of geographical center for the State of Nevada.

Response
In the Final EIS DOE identifies mostly rail as its preferred mode of transportation both nationally and in the State of Nevada. DOE has not identified a preference among the five candidate rail corridors in Nevada. If the Yucca Mountain site was recommended and approved, DOE would issue, at some future date, a Record of Decision to select a mode of transportation. Thereafter, for example, if mostly rail was selected (both nationally and in Nevada), DOE would then identify a preference for one of the rail corridors in consultation with affected stakeholders,

particularly the State of Nevada. In this example, DOE would announce a preferred corridor in the *Federal Register* and other media. No sooner than 30 days after the announcement of a preference, DOE would publish its selection of a rail corridor in a Record of Decision. A similar process would occur in the event that DOE selected heavy-haul truck as its mode of transportation in the State of Nevada. If rail was selected in Nevada, DOE has committed to preparing additional National Environmental Policy Act studies and documentation for the specific alignment of a rail route within the selected rail corridor.

10 (11522)
Comment - EIS002252 / 0008
The Draft Environmental Impact Statement fails to adequately address cumulative impacts for the entire nuclear chain for mining, nuclear weapons, and waste production.

Response
The cumulative impact assessment in Chapter 8 of the EIS includes past, present, and reasonably foreseeable actions in the affected area. Many studies have addressed, in quantifiable terms, the radiation levels in the environment from the nuclear fuel cycle. DOE believes that the baseline descriptions of the affected environment in Chapter 3 capture background levels of radiation that persist in the environment from nuclear facilities such as uranium mines, mills, fuel-processing plants, nuclear powerplants, and waste transport. According to the *Final EIS for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Components* (DIRS 103218-DOE 1996), the estimated dose to individuals from the nuclear fuel cycle is less than 1 millirem per year. That is, radioactive fallout from atmospheric weapons tests, emissions of radioactive material from DOE facilities, emissions from mineral extraction facilities, and transportation of radioactive materials combined contribute less than 1 millirem per year to the average dose to an individual.

10 (12092)
Comment - EIS002307 / 0006
Section 6 of the DEIS is incorrect about the transportation risks involved because the DEIS uses highway conditions that do not reflect actual highway conditions that would be present in transporting the spent nuclear fuel.

Response
The transportation analysis in Chapter 6 of the EIS used the best available information concerning the condition of highways being considered for waste transport. In addition, highway conditions, including accident and fatality rates, would be unlikely to change much between now and the time when waste shipments could begin.

10 (12123)
Comment - EIS001887 / 0422
Integration of policies within and among government agencies is necessary to prevent wasteful duplication. The NEPA [National Environmental Policy Act] process is meant to minimize conflicting goals by integrating related activities, legislation, and policies to avoid internal and interagency conflicts. Often, threats to the environment can be traced to unintended effects of conflicting federal efforts. Avoidance of this by integrating government activities is a direct purpose of NEPA for encouraging productive harmony between humans and their environment. Thus, the EIA [environmental impact assessment] process should reveal the need for integrated federal public works planning to minimize conflicting programs. However, much federal activity and related legislation is in response to particular considerations with little effort given to inadvertent consequences, environmental effects, socioeconomic impacts, or other consequences. In a pluralistic democratic society, each stakeholder group pushes its agenda with indifference to the values of other groups, and often federal agencies make no effort to avoid the shortcoming. Once again, in programs such as the YMP [Yucca Mountain Project], it is necessary that potential conflicts between future projects be addressed in a reasonably foreseeable manner. The Yucca Mountain region in particular is susceptible to such long-term impacts that have to be addressed in a context of ecosystem management. Such is among the intents of the existing Five-Party Cooperative Agreement for the region that DOE has refused to adopt for the YMP.

Response
The five-party Cooperative Agreement coordinates and enhances management of natural resources in the Great Basin and Mojave Desert ecosystems on the Nellis Air Force Range, Desert National Wildlife Range, and the Nevada Test Site. The five agencies are DOE's Nevada Operations Office (operator of the Nevada Test Site), the U.S. Air Force (operator of the Nellis Air Force Base), the Bureau of Land Management's Las Vegas Field Office,

the U.S. Fish and Wildlife Service, and the State of Nevada. If the repository was recommended and approved for development, DOE would consider including the Yucca Mountain Project in the Cooperative Agreement, and would reevaluate the need for a site-specific land-use plan to ensure compliance with all applicable requirements. That plan, based on the principles of ecosystem management and sustainable development, would formally synthesize the Yucca Mountain Project policies and procedures already in place; draw on the successes of the Resource Management Plan for the Nevada Test Site; and solicit input from Federal and State agencies, stakeholders, and the general public.

DOE agrees it is important to interact with other agencies to minimize conflicting programs or actions. Appendix C of the EIS describes agency interactions. One of the purposes of these interactions is to discuss issues of concern with organizations that have an interest in or authority over land that repository-related actions could affect or with some other interest the Yucca Mountain Project could affect. In addition, DOE has solicited and documented input from stakeholder groups through the EIS scoping process, comments on the Draft EIS, and other means. These interactions are described in the *Summary of Public Scoping Comments Related to the Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nevada* (DIRS 104630-YMP 1997) and in this Comment-Response Document.

Chapter 8 of the EIS estimates the potential cumulative impacts associated with various agency actions in the defined region of influence. The actions identified were based on documents issued by, and discussions with, DOE's Nevada Test Site, the U.S. Air Force, the Bureau of Land Management, the U.S. Fish and Wildlife Service, and the State of Nevada. The documents include resource management plans, EISs, environmental assessments, strategic plans, consultation documents, and tribal meeting records prepared by Federal, state, local, and private organizations.

10 (12247)
Comment - EIS001816 / 0027
Cumulative Impacts: In the year 2010 it is possible that on the roads in Lincoln and especially Nye County, there could be nuclear waste transportation by truck from three sources: 1) Yucca Mountain HLW/SNF [high-level radioactive waste/spent nuclear fuel]; 2) DOE NTS [Nevada Test Site] LLW [low-level radioactive waste] disposal; and 3) DOE NTS Plutonium soil cleanup. The DEIS must analyze for the estimated number of trucks that would move on Nevada roads each day under this possible scenario. The DEIS must analyze for how much emergency response training and other mitigation effort would be required to adequately manage this much potential nuclear waste transportation in Southern Nevada.

Response
DOE has expanded Section 8.4.2 of the Final EIS to include an assessment of the cumulative impacts in Nevada of transporting transuranic radioactive materials from high- and low-level radioactive sites to the Nevada Test Site. Section 180(c) of the NWPA requires DOE to provide technical assistance and funds to states for training of public safety officials of appropriate units of local government and Native American tribes through whose jurisdictions the Department would transport spent nuclear fuel and high-level radioactive waste. The training shall cover procedures required for safe routine transportation of these materials, as well as procedures for dealing with emergency response situations. If there was a decision to proceed with the development of a repository at Yucca Mountain, shipping routes would be identified approximately 5 years before shipments began and Section 180(c) assistance would be made available approximately 4 years prior to shipments through a jurisdiction. See Section M.6 of the EIS for a discussion of the DOE Section 180(c) policy and procedures.

The Price-Anderson Act establishes a system of financial protection (compensation for personal injury and property damage, including loss of use of property) for the public in a nuclear accident, regardless of who causes the damage. See Section M.8 of the EIS for a discussion of the Price-Anderson Act.

10 (12248)
Comment - EIS001816 / 0010
Section 8.3 Cumulative Long Term Impacts (page 8-73): It has reported that Area 25 will eventually come under the administrative control and responsibility of the DOE-YM [Yucca Mountain] program. It has also been reported that the radioactive contamination in parts of Area 25 particularly to support the nuclear rocket program will come under the stewardship of the entity responsible for managing Area 25. If the NTS EM [Environmental Restoration

and Waste Management] program eventually completes its mission in the next decade and DOE-YM is the designated steward for Area 25, the DEIS must analyze the DOE-YM requirement to negotiate a FFACO [Federal Facility Agreement and Consent Order]-like agreement with the State of Nevada to become the legal steward and subsequent environmental manager for all Area 25 sites.

Response
DOE has not determined future responsibilities for the management of Area 25. There are no known sites in Area 25 where spent nuclear fuel has been buried. Parts from the old nuclear rocket program, and perhaps some fuel from this program, might be buried somewhere in Area 25, but nothing definite is known about the nature of the material or where it might be buried. This material was not accounted for in the cumulative impacts analysis because its existence, location, amount, and characteristics are not known.

10 (12271)
Comment - EIS001879 / 0023
p. 8-59 through 8-73, Section 8.3.1

The EIS should state that chromium groundwater concentrations would exceed the Maximum Contaminant Level at the 95th percentile for the Inventory Module 1 high thermal load scenario at 5 and 20 kilometers.

Response
DOE has revised Section 8.3.1 to include appropriate comparisons of chromium groundwater concentrations with Maximum Contaminant Level Goals. The estimated peak concentration of chromium in well water during the 10,000-year postclosure period from the Proposed Action or from Inventory Module 2 would be far below the Maximum Contaminant Level Goals listed in Table 8-52 of the Final EIS.

10 (12319)
Comment - EIS010242 / 0030
Page 3-22: Section 3.3 - Cumulative Impacts

Cumulative impacts should be re-evaluated based on responses to the comments provided above, [additional truck shipments, hazardous metals, etc.] as some will result in potentially significant changes in the assessment.

Response
Since the issuance of the Supplement to the Draft EIS, the Department has continued to evaluate actions in the region of influence that could pose a potential cumulative impact. As a result of these reviews, the Department identified several new actions for which information was not available for the Draft EIS. These actions come from several agencies and private companies. For instance, Chapter 8 of the Final EIS contains an expanded discussion of the Timbisha Shoshone Homeland Act, along with possible implications to groundwater rights. Chapter 8 also contains discussions of other actions by the Bureau of Land Management (such as the Ivanpah Cargo Airport and the Moapa Paiute Energy Center), and these actions were considered when evaluating the cumulative impacts for the technical discipline areas.

As part of the updated analyses, the Department has expanded the land-use discussion of Section 8.2.1 to specifically address the known actions that have been identified since the publication of the Draft EIS. Where possible, the Department has identified changes in land use along with estimates of acres to be disturbed and possible impacts with other actions in the area. In addition, all discipline areas (for example, biological resources and cultural resources) were reviewed to ensure that the appropriate level of discussion was included to address the potential cumulative impacts of all the actions. Not all actions could be evaluated to the same level of detail because information was not always available to allow an in-depth evaluation.

10 (12338)
Comment - EIS001879 / 0009
The Military Lands Withdrawal Act of 1986 required the preparation of the Special Nevada Report. This report, finalized in September 1991, contains a description of current and proposed defense-related activities in the State of Nevada, an analysis of their impacts, and possible actions that could be taken to mitigate those impacts. The report was prepared jointly by the Departments of the Air Force, Navy, and Interior with the Department of Army and

DOE listed as cooperating agencies. Per Section 6(b)(1)(D) of the Act, the Special Nevada Report was mandated to include the lands withdrawn or being considered for withdrawal for use by the DOE.

With respect to water resources, a number of impacts were found to result from the cumulative land withdrawals including the lack of access to potentially developable water resources, water quality impairment, resource consumption by federal agencies, and resource competition with non-federal water users. Page 8-97 of the Special Nevada Report states that:

"The withdrawal of land from public access and/or the purchase of water rights by DOD [the Department of Defense] and DOE has the greatest potential for effects on Nevada... The water resources associated with these lands could, if they exist and were available, play an important role in the continued growth of southern Nevada."

The Special Nevada Report is not referenced in the Draft EIS for Yucca Mountain. Neither are the direct, indirect, or cumulative impacts of federal land withdrawals and water use considered and evaluated. These impacts are significant. The failure of the Draft EIS to incorporate the findings of the Special Nevada Report is a serious inadequacy in the document. These impacts continue to occur, have never been mitigated, and will be exacerbated by the additional land withdrawal and subsequent constraints on water availability. The EIS must be revised to include the findings of the Special Nevada Report and must include an evaluation of the cumulative consequences of the land withdrawal for the proposed repository at Yucca Mountain.

It is not acceptable for the DOE to assert that the Special Nevada Report has been superseded by recent NEPA [National Environmental Policy Act] documents prepared by the Departments of Energy, Defense, or the Interior as the Special Nevada Report is not a NEPA document but rather an independent evaluation of impacts. That recent NEPA documents prepared by these Departments did not take into account the findings of the Special Nevada Report represents the continued failure of federal agencies to perform adequate impact evaluations in the preparation of those documents, and is not a valid basis for the DOE to also ignore the findings of this important Congressionally mandated report.

Response
Chapter 8 of the Final EIS has been revised to include a discussion of the *Special Nevada Report* (DIRS 153277-SAIC 1991). It should be noted, however, that the *Special Nevada Report* is more than 10 years old, and many changes have occurred since the report was prepared. For instance, in December 1998 the Navy decided to reduce sharply its request to withdraw airspace over central Nevada, even though the impacts of a larger withdrawal were discussed in the *Special Nevada Report* (for information about the Navy's current airspace requirements in Nevada. The Department is obligated to provide technical analyses based on the current state of knowledge. For that reason, the Department did not reference the *Special Nevada Report* in the Draft EIS. Instead, the Department reviewed current resource plans, EISs, environmental assessments, tribal meeting records, and other documents prepared by Federal, state, local, and private organizations as a means to determine past, present, and reasonably foreseeable actions that, combined with the repository, could contribute to cumulative impacts.

10 (12381)
Comment - EIS001888 / 0389
[Clark County summary of comments it has received from the public.]

Commenters suggested that the analyses address cumulative impacts considering both (1) critical habitats for threatened, endangered, and sensitive species, including impacts from radiation exposure during accident-free operations and from accidents, and (2) impacts to wildlife habitat and migration (wild horses, bald eagles), and big game populations along transport corridors/corridor improvements/borrow areas (Big Smoky Valley, Lincoln County, Clark County, Elko region) and the loss of hunter-generated revenue.

Response
Section 8.2.4 of the EIS describes short-term cumulative impacts to biological resources from the construction and operation of the proposed repository. DOE expects such impacts to be negligible during incident-free operations and from accidents. Section 5.9 addresses impacts to biological resources after repository closure. Because radiological impacts to humans would be small (within the regulatory limits established by 40 CFR Part 197), DOE did not quantify impacts to biological resources from exposure to contaminated groundwater.

Section 6.1.2.4 of the EIS summarizes impacts to biological resources from waste transport through Nevada, and Sections 6.3.1.1, 6.3.2, and 6.3.3 describe these impacts in more detail for legal-weight truck, rail, and heavy-haul truck and associated intermodal transfer stations, respectively. Loss of wildlife habitat from construction of a branch rail line would be the greatest potential impact to biological resources, potentially affecting the desert tortoise, a threatened species. Loss of desert tortoise habitat would amount to approximately 2.4 square kilometers (590 acres) for the Caliente-Chalk Mountain Corridor, 3 square kilometers (740 acres) for the Caliente and Carlin Corridors, 5 square kilometers (1,200 acres) for the Valley Modified Corridor, and more than 11 square kilometers (2,700 acres) for the Jean Corridor. All the corridors have a low abundance of desert tortoises with the exception of limited areas along the Jean Corridor where abundance is higher.

The potential for impacts from upgrading Nevada highways for heavy-haul truck use would be small because road modifications would occur in previously disturbed rights-of-way. The construction of an intermodal transfer station could disturb about 0.2 square kilometer (50 acres) of desert tortoise habitat. Other special-status species could be affected, depending on the route. Impacts from Nevada transportation operations, with the exception of infrequent wildlife kills by vehicles, would be unlikely. As with heavy-haul trucks, legal-weight truck shipments would have negligible impacts on biological resources because they would use existing highways.

Economic impacts from the loss of hunting revenues would be negligible from the construction and operation of a branch rail line or an intermodal transfer station. DOE bases this conclusion on the analyses in Chapter 6 of the EIS that show impacts to wildlife from any of the transportation implementing alternatives would be small.

In the Final EIS, DOE identifies mostly rail as its preferred mode of transportation both nationally and in the State of Nevada. DOE has not identified a preference among the five candidate rail corridors in Nevada. If the Yucca Mountain site was recommended and approved, DOE would issue, at some future date, a Record of Decision to select a mode of transportation. Thereafter, for example, if mostly rail was selected (both nationally and in Nevada), DOE would then identify a preference for one of the rail corridors in consultation with affected stakeholders, particularly the State of Nevada. In this example, DOE would announce a preferred corridor in the *Federal Register* and other media. No sooner than 30 days after the announcement of a preference, DOE would publish its selection of a rail corridor in a Record of Decision. A similar process would occur in the event that DOE selected heavy-haul truck as its mode of transportation in the State of Nevada. If rail was selected in Nevada, DOE has committed to preparing additional National Environmental Policy Act studies and documentation for the specific alignment of a rail route within the selected rail corridor.

10 (12589)
Comment - EIS001816 / 0008
Section 8.3 Cumulative Long Term Impacts (page 8-76): The Federal Facility Agreement and Consent Order (FFACO) requires the DOE-NV [the DOE Nevada Operations Office] to determine the contaminant boundary for underground testing radioactive water at the NTS [Nevada Test Site] for a 1,000 year period. The contaminant boundary will be based on the 4 millirem/year standard for groundwater. Yucca Mountain must explain why it prefers the groundwater standard of the EPA [Environmental Protection Agency] over the NRC [Nuclear Regulatory Commission] to set this performance standard for the repository. If the NTS UGTA [Underground Test Area] program has to define groundwater contaminant boundaries at 4 millirem/year, and the State of Nevada has to define compliance boundaries at 4 millirem/year, Yucca Mountain should adhere to the same standard just in case existing plumes migrate closer to and beneath the repository footprint. Existing NTS radioactive contamination occurs in the same hydrologic units as those predicted to be contaminated by leakage from the repository over time, therefore, the DEIS must analyze for the 4 millirem/year standard and the reasons for regul [sentence cut off].

Response
The Nuclear Waste Policy Act, as amended, directed the Environmental Protection Agency and the Nuclear Regulatory Commission to develop standards for the performance of the proposed repository at Yucca Mountain and these agencies have done so. The Environmental Protection Agency's standards are at 40 CFR Part 197 and the Nuclear Regulatory Commission's standards are at 10 CFR Part 63.

The 10,000-year peak dose reported in the EIS at the 95th percentile for the Proposed Action would be 0.58 millirem per year at 18 kilometers (11 miles). The dose would decrease to 0.28 millirem per year at 30 kilometers (19 miles), which is the distance to most of the population that could be affected by groundwater transport (see Table 5-4).

Even with the addition of radiological contaminants from past weapons testing on the Nevada Test Site, and the possibility of additional wastes at the repository (Inventory Modules 1 and 2), the cumulative dose at 18 kilometers would be about 2.6 millirem per year. Even though not legally bound by the Federal Facility Agreement and Settlement Order standard, the performance of the repository would be compatible with that Order.

10 (12599)
Comment - EIS010279 / 0019
The description of *Cumulative Impacts (p. 3-22)* is completely inadequate. Stating that cumulative impact changes between the DEIS designs and the proposed designs in the SDEIS would be "proportional" or a "20-percent increase" does not explain anything. Cumulative impacts of the present designs of the proposed project need to be evaluated in plain language.

Response
DOE regrets the confusion. As described at the end of Section 3.3 of the Supplement to the Draft EIS, DOE expected the cumulative impacts associated with the flexible design to be essentially the same as the cumulative impacts described in Chapter 8 of the Draft EIS. DOE has continued to evaluate actions since the Supplement was issued and has updated Chapter 8 accordingly.

10 (12697)
Comment - EIS001816 / 0006
Section 8.3 Cumulative Long Term Impacts (page 8-76): the statement regarding no radioactive contamination attributable to underground tests has been detected in monitoring wells off the Nevada Test Site [NTS]. There is a saying that goes, "Absence of evidence is not evidence of absence." There is no state of the art monitoring system on or off of the NTS, because the federal government hasn't constructed one based on where [contaminants] are know to migrate. It is highly likely that underground test contamination is past the NTS boundary because the phenomenon of prompt injection has probably blown the radionuclides past the NTS boundary the same way it probably blew Europium 0.8 miles at the Benham test site with some assistance from colloids. Yucca Mountain must analyze how to establish a joint effort with the UGTA [Underground Testing Area] program to establish a state of the art monitoring network in Nye County to monitor both existing and future radionuclide contamination in the groundwater system.

Response
The Yucca Mountain Project has a working relationship with the Nevada Test Site's Underground Test Area Program to produce a regional groundwater flow model of the Death Valley hydrologic system. DOE will continue to foster this relationship to plan for future groundwater studies and groundwater monitoring.

As a result of monitoring concerns expressed by many commenters, DOE has supported Nye County in its program (called the *Early Warning Drilling Program*) to characterize further the saturated zone along possible groundwater pathways from Yucca Mountain as well as the relationships among the volcanic, alluvial, and carbonate aquifers. Information from the ongoing site characterization program (and possible performance confirmation program, which is described below) would be used in conjunction with that of the Early Warning Drilling Program to refine the Department's understanding of the flow and transport mechanics of the saturated alluvium and valley-fill material south of the proposed repository site, and to update conceptual and numerical models used to estimate waste isolation performance of the repository. When DOE published the Draft EIS, only limited information from the Early Warning Drilling Program was available. Since then, however, this program has gathered additional information, which DOE has incorporated in the EIS.

In addition, DOE has installed a series of test wells along the groundwater flow path between the Yucca Mountain site and the Town of Amargosa Valley as part of an alluvial testing complex. The objective of this program is to better characterize the alluvial deposits beneath Fortymile Wash along the east side of Yucca Mountain. Single- and multiwell tracer tests have begun and the results thus far have strengthened the basis of the site-scale saturated flow and transport model. Information from this program has been incorporated in the EIS.

If the site was approved, DOE would institute a Testing and Performance Confirmation Program, elements of which would address the hydrologic system. The purpose of this program would be to evaluate the accuracy and adequacy of the information used to determine whether the repository would meet long-term performance objectives. The

Testing and Performance Confirmation Program, which would continue through closure of the repository (possibly as long as 300 years), would offer a means to further understanding of the hydrologic system and reduce uncertainties.

10 (13310)
Comment - EIS010317 / 0006
Section 3.3 of the DEIS-S is titled "Cumulative Impacts." This section consist of just two short paragraphs. The FEIS should devote far more space to this section. For example, the new proposals for installing titanium shields over the waste package will require the mining of large quantities of titanium ore, frequently in other parts of the world. It would be appropriate to examine the cumulative environmental impact of extracting, processing and transporting such large amounts of titanium. Also, an evaluation should be made to assess the possible impact on other users of titanium such as the U.S. aerospace industry and the U.S. submarine construction industry. Since the proposals include the use of large quantities of other expensive metals, such as nickel and molybdenum and chromium, and environmental examination of the environmental impacts of their extraction, production and transport would be in order.

Response
The Supplement to the Draft EIS addressed the requirements for, and the availability of, titanium, and compared these requirements to U.S. production (see Section 3.1.15 of the Supplement). Section 4.1.15.5.4 of the Final EIS also addresses titanium requirements. The Department recognizes that a substantial amount of titanium would be required for the drip shields. The impacts of acquiring titanium were not examined in the Supplement or in the Final EIS because this material would not be required for almost 100 years.

The Draft EIS addressed the requirements for, and the availability of, nickel, molybdenum, and chromium, and compared these requirements to U.S. production. Section 4.1.15.5.4 of the Final EIS also addresses these requirements. As stated, the annual demand for nickel by the Yucca Mountain Project would be less than 1 percent of U.S. consumption and about 0.1 percent of world production. Because the Project's demand for these materials would not be expected to affect U.S. or world markets, the impacts of acquiring these materials were not examined in the EIS.

10 (13311)
Comment - EIS010317 / 0007
Another cumulative impact that was not mentioned in the DEIS-S, and only hinted at in the DEIS, involves the nearly one thousand underground nuclear detonations conducted at the adjacent Nevada Test Site. These, explosively blasted spent-fuel like debris into the underground formations that lay "up-stream" from the Yucca Mountain Study site. The testers were exempt from the waste containment regulations that a Yucca Mountain repository must meet. In fact, about a third of the tests were conducted below, or just above, the water table, often leaving nuclear debris in regions with flowing water. In 1997 the DOE's Nevada Operations Office released a report, largely generated by its contractors, that estimated that a partial cleanup of the NTS underground test areas could cost as much as $7.3 trillion ("Focused Evaluation of Selected Remedial Alternatives for the Underground Test Area (DOE/NV--465, April 1997). The Cumulative Impacts section of the FEIS should mention that $7.3 trillion figure as a point of reference.

Response
Section 8.3.2.1 of the Draft EIS discussed the activities at the Nevada Test Site and acknowledged the potential for large amounts of radioactivity as a potential long-term impact. In the Final EIS the department has updated the information based on more recent analyses of the potential long-term impacts from these activities.

With regard to remediation estimates for the underground test areas, the 1997 report cited by the commenter does list a cost that could be as high as $7.3 trillion. However, it is important to realize that this report was prepared for the purpose of evaluating technologies that could be used to aid in remediation, not as a planning document for cleanup of the Nevada Test Site.

In 1998, the Department published *Accelerating Cleanup: Paths to Closure* (DIRS 107294-DOE 1998) and has continued to update that report with supplemental information to present the status of cleanup efforts in the DOE complex. The report estimated a total cost of less than $3 billion for all projects at the Nevada Test Site. In addition

to cleanup and remediation activities, this estimate includes subsurface monitoring and surveillance of the sites for up to 100 years (DIRS 107294-DOE 1998).

The Department is continuing environmental restoration at the Nevada Test Site and is studying and monitoring groundwater contamination of the underground test areas. No long-term plans for remediating the underground test areas have been developed, and the wide range of costs, technical issues, and health and safety considerations in the report cited by the commenter make it premature to project an impact on the region from these activities.

10 (13452)
Comment - EIS010296 / 0038
On page 3-7, it is noted that the range of water demand for lower-temperature operations, combined with ongoing NTS [Nevada Test Site] water demand would be slightly below the lowest estimate of sustained yield for the hydrographic area (western two thirds of the Jackass Flats Groundwater basin, see p. 4-29 of the Draft EIS), but the addition of an aging facility could lead to water use of 100 percent of the lowest estimated perennial yield. It would be as low as 16 percent of the maximum estimated perennial yield. Buqo (1999) notes on p. 14 that "Localized water-level declines and changes in flow directions in the vicinity of DOE water supply wells has occurred and will continue to occur in proportion to the level of water needed to support the Test Site Operations. Overdraft has historically occurred on the NTS in the Yucca Flat hydrographic basin because of its perennial yield (700 acre feet per year). Future DOE water withdrawals on the NTS are not expected to exceed the perennial yields of any of the source basins." The estimates of perennial yield are exactly that - estimates. The estimated use might greatly exceed actual perennial yield.

Response
The Department used estimates of perennial yield that were prepared by the Nevada State Engineer. The Department recognizes that these are estimates, but they represent the best estimates available.

10 (13527)
Comment - EIS010392 / 0010
In light, of the effects on transportation, the cumulative impacts analysis should be re-evaluated. As it is now, the cumulative impacts analysis is not sufficient.

Response
The design evaluated in the Supplement to the Draft EIS (the flexible design) does not substantially affect the results of the cumulative-impacts evaluation described in Chapter 8 of the Draft EIS. The basic elements of the Proposed Action described in the Draft EIS are identical to the Proposed Action described in the Supplement; that is, to construct, operate and monitor, and eventually close, a geologic repository at Yucca Mountain. Because the design enhancements described in the Supplement had little effect on other elements of the repository program, the scope of the Supplement was limited to a discussion of the new design and its associated impacts. The transport of spent nuclear fuel and high-level radioactive waste to the repository would not be affected by the repository design described in the Supplement or how this design might evolve further. The amount of waste that could be transported to the repository is fixed. Therefore, the impacts of waste transport to the repository, including cumulative impacts, were not evaluated in the Supplement. In Chapter 6 of the Final EIS, DOE has modified and updated several analyses related to the transport of spent nuclear fuel and high-level radioactive waste to Yucca Mountain in response to public comments. Many of these changes are based on updated population data, and projections of future populations, near possible transport routes.

REFERENCES

146592	Black and Townsend 1998	Black, S. C. and Townsend, Y. E., eds. 1998. *Nevada Test Site, Annual Site Environmental Report for Calendar Year – 1997*. DOE/NV/11718-231. Las Vegas, Nevada: U.S. Department of Energy, Nevada Operations Office. TIC: 242871.